Editorial

THE explosion of the H-bomb and the widespread evidence of radio-activity which followed have caused apprehension all over the world of the damage to life and territory which might take place unless a halt is called.

Because of the vast power unleashed by H-bomb explosions, many feel that it would be wise to abandon the matter altogether for fear that some catastrophe will follow should scientists lose control of the powerhouse they have created.

It is understandable that this should be so, and that such fears should exist particularly among those who have no real knowledge of the physics involved.

I feel that in matters of this kind we must base our thinking on the very widest background. Nothing in the present, past or future can come between man and his struggle to find the truth behind the universe in which he lives. History is filled with stories of enlightened men dabbling with things which "ought not to be known", and who even lost their lives as a reward.

It is human to fear that which is not understood, and we have all been impressed by the terrific evidence of atomic explosions shown to us in pictures and told in graphic words.

This evidence, I feel, has clouded our judgment as to the ultimate uses of atomic power. We have seen it "in the raw", we have not seen it driving our machines, harnessed to our industry, making our lives better and our tasks more effective. There is nothing more devastating to onlookers than a mighty forest fire which kills and mutilates. But it is the same fire which warms our hearths in winter, although in the hands of children it could burn down our homes.

Atomic experiments are not being conducted by children. They are controlled by the most experienced scientists in the world. These men do not know everything, and many have already given their lives because all that happens is not completely predictable. But if we are sufficiently adult to undertake the responsibility of learning, we must also be prepared to shoulder the risks that go with it.

No one will accept without unhappiness the casualties which must always accompany anything as vast as atomic research. No one will tolerate ineptitude or unnecessary dangers. But whatever comes there can be no turning back. In every field of human endeavor, large or small, the pathway always lies ahead.

John Moyle

INDEX

	Page
Testing Torpedoes On Land	3
PMG Will Licence FM Stations ..	4
New Radio Paging Device	7
Do People Live On Mars?	9
Electronic Judges Word Is Final ..	11
Metals Stronger By 100 Times	13
Things Happen Under Pressure ..	14
Technical Review	19
News And Views	25
More On The Geiger Counter	28
R & H Telephone Amplifier	35
The Serviceman Who Tells	37
AC Power For Electroflash	42
How To Line Up Your Receiver ..	51
A Course In Television	54
R & H Senior Signal Tracer	56
Here's Your Answer, Tom	68
A Folder For Metal Sheet	70
Trade Notes And News	79
A Reader Built It	83
Let's Buy An Argument	84
Off The Record	92
Record News From Abroad	95
What Is This High-G Story	96
Short Wave Notes	98
The Ham Bands	99
Making A Brick Incinerator	105
Answers To Correspondents	110

RADIO AND HOBBIES IN AUSTRALIA

A NATIONAL MAGAZINE OF RADIO, HOBBIES AND POPULAR SCIENCE

EDITOR
JOHN MOYLE
S.M.I.R.E. (Aust.)

TECHNICAL EDITOR
NEVILLE WILLIAMS
M.I.R.E. (Aust.)

TECHNICAL STAFF
RAYMOND HOWE
MAURICE FINDLAY
PHILIP WATSON
MERVYN HUDDLESTON

Vol. 16, No. 2

SUBSCRIPTION RATES
C'wealth, NZ, N. Guinea, Fiji—18/- pa
United Kingdom—£ 1/-/6 pa
B. Empire—£ 1/3/- pa
Foreign—£ 1/5/- pa

Published on the first Friday of each month by Associated Newspapers Ltd., 60-70 Elizabeth St., Sydney.

Phone BO333

OUR COVER PICTURE

We remember having seen somewhere before the pictures of a radio set built into a sun helmet. This one just happened to catch our eye and we couldn't resist using it for our cover. The earphones are fastened underneath the brim.

COMPLETE ELECTRICAL INSTRUMENTATION

PATON ELECTRICAL PTY. LTD

PATON ELECTRICAL

presents under the Trade Name of "Palec" the largest range of electrical indicating instruments manufactured in the Southern Hemisphere!

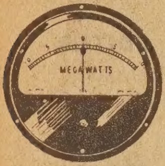
The needs of Australian Industries for electrical instruments are catered for by Palec as never previously. The extensive and varied ranges of high grade models are designed to meet practically every electrical requirement, and the moderate prices and long life efficiency have earned for Palec the highest commendations of users.

More than twenty distinct models and sizes, each with varying functions, are available, including Hermetically Sealed Miniatures, Panel, Heavy Duty Switchboard, Flameproof and Controller Patterns. Built to established standards, Palec instruments will withstand the most rigorous and exacting conditions encountered in modern industry from the Antarctic to the Tropics.

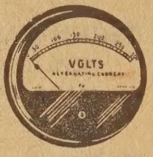
MOVING COIL Panel & H.D. Switchboard	MOVING IRON Panel & H.D. Switchboard	DYNAMOMETER H.D. Switchboard (Single/Polyphase)
D.C. CURRENT D.C. VOLT RECTIFIER A.C. THERMAL R.F. PYROMETERS CONTACTING	A.C.-D.C. CURRENT A.C.-D.C. VOLTS CONTACTING	WATTMETERS VARMETERS POWER FACTOR METERS FREQUENCY METERS SYNCHROSCOPES AMMETERS VOLTMETERS

Other Products include:

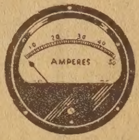
★ Multimeters, Valve Testers, Signal Generators, Vacuum Tube Voltmeters, etc.
★ First Grade and Sub-standard Portables and Specials.
★ Photographic Exposure Meters and Electronic Speed Flash.
★ Oven Temperature Gauges.
★ 10 Amp. Rotary Selector Switches.
★ Current and Potential Transformers.



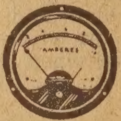
650



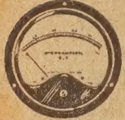
600

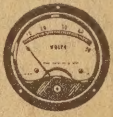


500

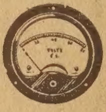


434Rd

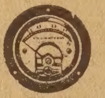

475Rd

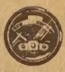


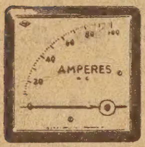
35Rd



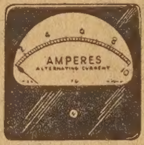
32


216Rd

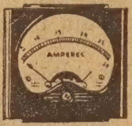

150



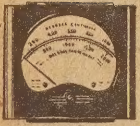
558Q

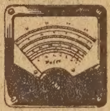


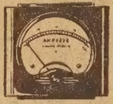
550



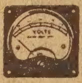
434Sq


475Sq

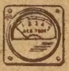

400

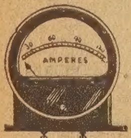


35Sq

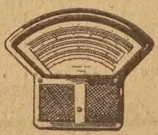


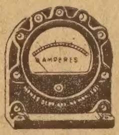
216Sq


HS1



Controller


625



Flameproof

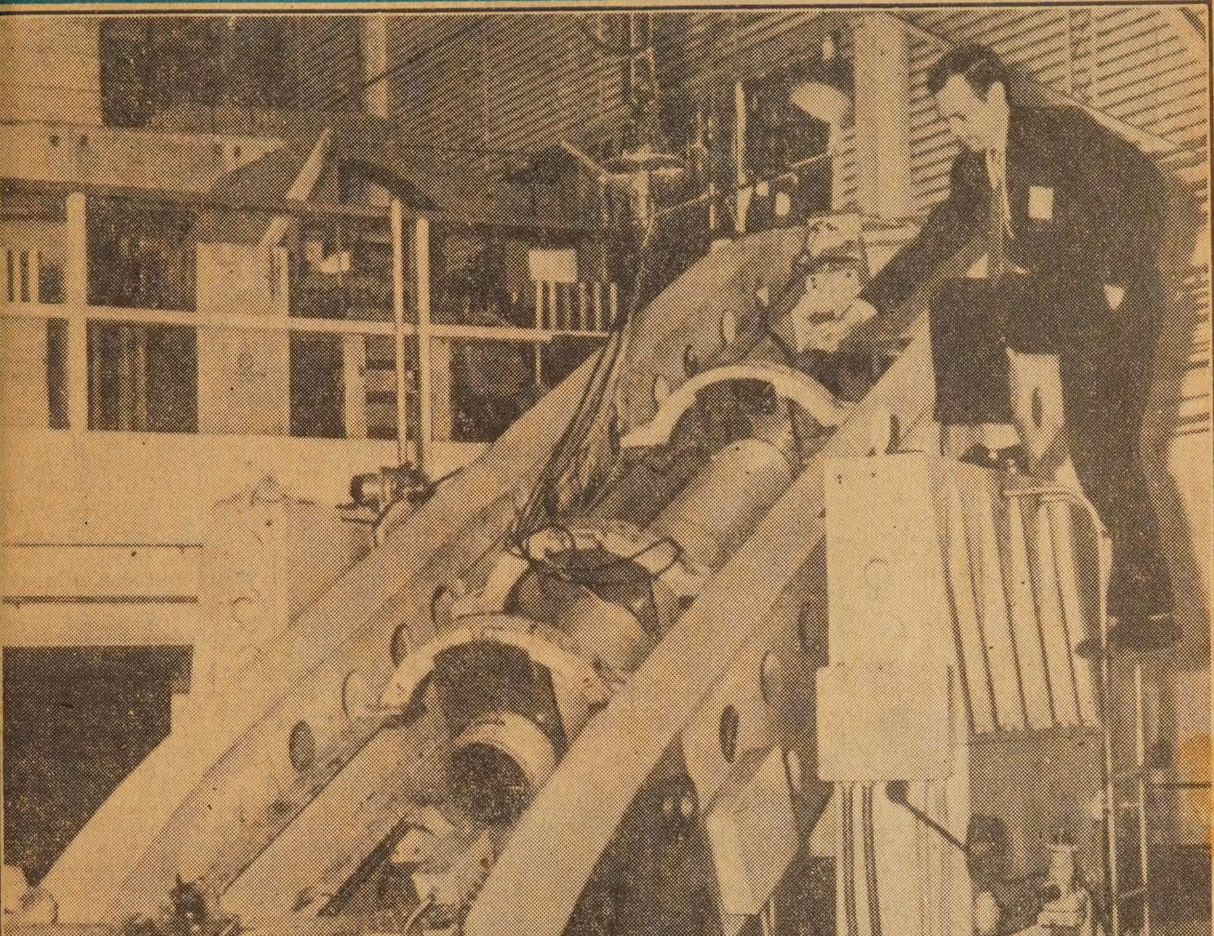
- **SERVICE**
  Our Australian-built products have the advantage of being backed by local Factory Services.
- **TECHNICAL PROBLEMS**
  Our Technical facilities are at your disposal.
  Australian Agents for
  MEGATRON PHOTO-ELECTRIC CELLS.

PATON ELECTRICAL

PTY. LTD.

Manufacturers of all Types of Radio & Electrical Test Equipment & Meters
90-94 VICTORIA ST., ASHFIELD, SYDNEY. UA 5266. TELEGRAMS: "PALEC"

TESTING TORPEDOES ON LAND

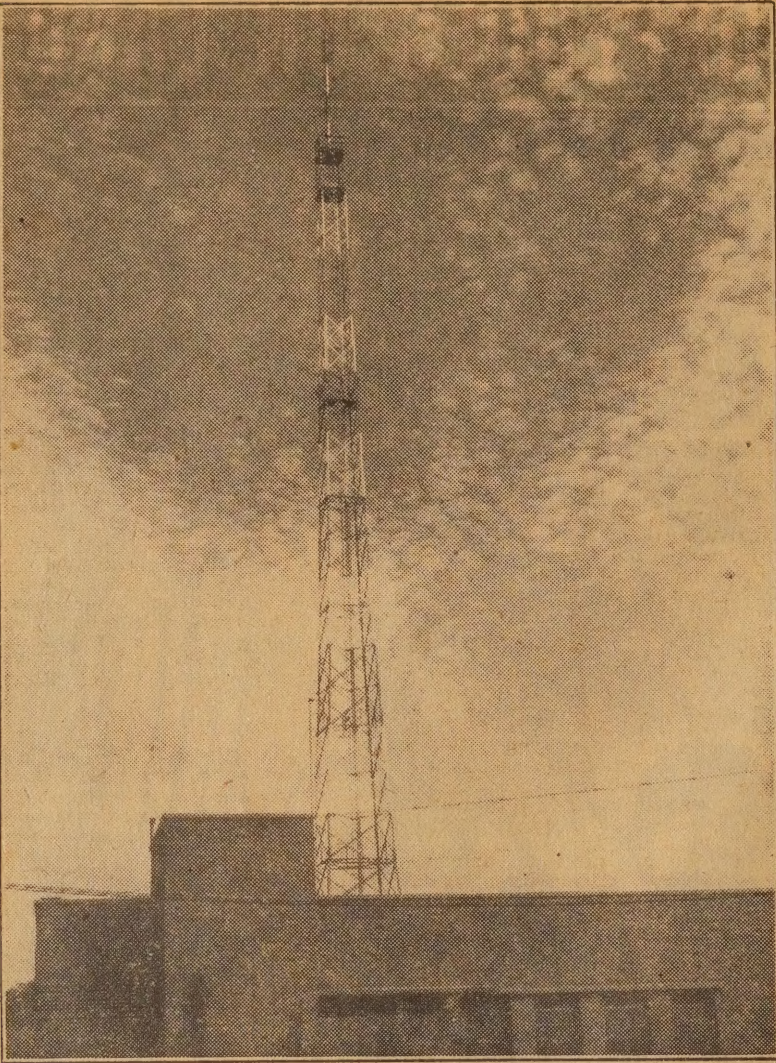


With the aid of this new electronic torpedo tester, the US Navy can put developmental torpedoes through simulated test-runs without ever going near the water. Dr. Jay Anderson, of the US Navy Ordnance Test Station, has just set up for a test an anti-submarine "homing" torpedo. The torpedo is guided to its target by acoustic devices and is so efficient that it will turn round and renew the attack if its first pass is evaded. Tests on the equipment cost a mere 4 dollars—a fraction of the cost where ships and crews are involved.

PMG Will Licence FM Stations

by The Editor

THE Postmaster-General said in Canberra last month that, if the Government was returned, the Broadcasting Act would be amended to allow private enterprise to establish FM broadcasting stations. This statement followed a recommendation from the Broadcasting Control Board for the early introduction of FM stations by the ABC and commercial stations. The Board believes that the limit has been reached for allocation within the present broadcast band, and that the only way to extend the scope of broadcasting is to open up the VHF bands where channels are available. It would be entirely up to the commercial stations whether or not they used the new bands. This article traces the history of FM in Australia and examines the appeal it holds for broadcasting.



The aerial of the FM station at Gore Hill, Sydney, rises over one of the PMG experimental stations which has been in operation for some years. So far it has attracted only a few listeners, but it might do better if its programs were advertised and placed on a regular broadcasting basis.

THE possibility of using FM for Australian broadcasting was first raised in 1944. It was then claimed to be the broadcasting system of the future, and the chairman of Parliamentary Broadcasting Committee in a glowing forecast commenced a torrent of controversy which raged fiercely in technical and political channels.

The general public, which despite copious explanations by way of Press articles, never quite understood the full story of FM, absorbed the many predictions that soon their radio sets would be out of date, and commenced a cautious buying period from which the radio industry never recovered. Many consider that anticipation of FM broadcasting, and later TV, was the biggest factor in creating and encouraging the lean period the radio industry has undergone almost since the end of the last war.

It may not be fair to blame either FM or TV as such for depressing radio receiver sales, for each was potentially the way toward greater activity. It is probably just as true to say that the fault lay mostly in so much unwise publicity, half-promises, and inaction which left all concerned precariously suspended in an atmosphere of complete uncertainty.

For despite all the talk about FM—and an inspection of newspaper files of the period shows how pointed it was—the only result has been an experimental station in each of three capital cities, which for years now have broadcast programs to a handful of specialised listeners.

Before attempting to assess the importance of this latest announcement, it might be well to consider briefly how FM differs from the present AM system we all know.

The letters FM stand for Frequency Modulation, and AM for Amplitude Modulation. They both refer to the method of impressing intelligence—speech, music and other sounds—on the waves sent out by the transmitter, the process called modulation.

An FM station does this by bringing about small changes in the frequency of the wave, which is measured in so many cycles per second. An AM station performs a similar process by varying the amplitude or power of the wave.

To be strictly accurate, both AM and FM stations require a band of frequencies for their operation but the FM station needs much more room to operate than an equivalent AM station. So much so that a sufficient number of them could not be accommodated on the broadcast band, and allocations for FM are never made in it.

The same thing is true to an even greater degree of TV stations, and for that reason, they are always given frequencies very much higher—in fact, the section of the radio spectrum in which they are accommodated is known as the Very High Frequency band. For various technical reasons, there is plenty of room in this region for such stations.

FM AND VHF

Because FM stations are always found on VHF, many tend to confuse the characteristics of FM with those of VHF.

For instance, the localised coverage of FM programs and the trouble they have diving into valleys is due to VHF propagation, and would be in evidence whether AM or FM were used on the same frequency. On the other hand, the ability of FM in certain circumstances to reject static and electrical interference noises is due to the FM as such and not VHF, and is generally considered a valuable point in its favor.

In practice, neither AM nor FM is troubled by electrical noises as long as the received signal is strong enough to swamp them out. Modern high-powered broadcast stations well sited should be as good as FM stations for all practical purposes except in the very noisiest electrical localities. Because the FM set is not sensitive to most types of electrical noise it would be preferred for bad spots. Normally electrical noise is received by an AM set in much the same way as the desired signals, and to cut it out would mean the elimination or distortion of the stations' programs.

BETTER MUSIC

The FM system can be made to transmit and receive signals of a higher musical standard than broadcast band AM stations. The musical range can be made wider, and a degree of pre-emphasis used similar to that employed for microgroove records. The contrast between loud and soft passages may also be greater, the general impression being of more realistic programs and quieter background.

At the same time, most people consider the present broadcast standards good enough, and don't hesitate to mutilate them musically by tone controls and the like. The musical advantages of FM should, therefore, be considered as being mainly for critical listeners.

The range of FM stations because of their VHF character is generally considered inferior to AM stations in the broadcast band, but this is not altogether true. Few broadcast stations are designed to cover a radius of more than 50 miles, and for closely settled areas this is sufficient. Modern developments have demonstrated that both broadcast band and FM stations can cover this area if correctly sited, if good receivers are used, and with properly designed aerial systems.

At night the broadcast band stations will often "skip" for hundreds of miles, but, in closely settled areas, very little use is made of this ability. Where long range is needed in either daylight or at night, the broadcast band is the only solution, but the majority of stations are not required for such service.

SIMPLER TRANSMITTERS

The transmitters needed for FM are appreciably less complicated and costly than those for AM, but the receivers are not. Despite the simplification made possible by modern developments in valves and circuits FM sets will be larger, more critical and more costly than broadcast band receivers. It is, in fact, only in the larger receivers that all the FM advantages can be realised. Small mantel type sets will retain only the better noise rejection, and then perhaps not as efficiently as the larger types. Experience has shown that large, complicated broadcast sets are not popular. Even modern radiograms usually have quite small receivers fitted to them.

In summing up the chief features of both broadcasting systems, a good case can be made for FM as possessing more attractions than AM except that receivers are more complicated and expensive. Were we starting our activities from scratch at this time, it would no doubt play a big part in our scheme of things.

HOST OF STATIONS

But because we already have an extremely large and inter-connected broadcasting network built round the broadcast band, we can only consider FM and its possible use against the background of this fact. Which brings us up to date.

At the moment, there are 150 licensed stations operating on the broadcast band in Australia. This colossal number is due to the desire to cover our large continent so that everybody will have programs.

Even so, there are still places where radio reception is not good. There are still many people who want to start up new stations. But the broadcast band is now so crowded that even with many widely separated, low powered stations sharing their frequency allocations, there is virtually no more room for others to begin. The interference problem in many areas is most acute, and even New Zealand allocations must be considered in this regard.

The chief consideration in squeezing stations into the band is the problem of interference between them. Certain standards of listener service are laid down as essential, and no more stations can be provided if these standards are thereby threatened.

By degrading the general excellence of service and transmissions it would be possible to add still more to the present number, but this is rightly considered as being most undesirable, and in any case could lead to a complicated shuffling round of station frequencies to make fully effective. At any rate, the Broadcasting Board has set its face against any such course.

Neither the PMG nor the Broadcast Board is opposed in principle to us having more stations — the problem is where to accommodate them. When FM was first mooted ten years ago, the Labor Government decided to confine its use to the ABC through the Broadcasting Act, much to the concern of the commercial stations, who at that time would almost certainly have considered at least running parallel services on two channels. But the only tangible results of all the wrangling were the three experimental FM stations already referred to operated by the PMG.

In the meantime interest had been aroused in FM broadcasting overseas. In the USA whole floods of licence applications came forward and many stations commenced operating. For a while it looked as though the hopes of FM's inventor, Major Armstrong, would stand a good chance of fruition.

IMPACT OF TV

No one will probably ever know, however, for a new and infinitely more powerful attraction jumped into prominence. Television, or TV, began that series of giant strides which were to build it into one of the world's largest industries. It literally crushed FM in the rush, for it had sight to offer—something quite new, and not merely an extension of sound which was already here.

As a result, FM broadcasting languished, and today is represented by only a few of those who had hoped to own flourishing stations.

Here in Australia we haven't yet got TV, but it is sufficiently near that no existing commercial stations are likely to consider FM has anything to offer them. Their immediate plans hold two aims—to improve their present resources to give the largest and best coverage for the biggest and best programs, and to husband anything they have left over in anticipation of some action on TV.

What would such a station gain from FM? Technically it would mean either abandoning a profitable spot in the broadcast band for a field where there are no receivers available, and no audience, or setting up a parallel FM channel in the hope that someone would make sets for others to listen.

But there would be no addition to the total audience and potential buying power of listeners. Coverage would be the same, if indeed something was not lost in the process, at the cost of maintaining a second station requiring special aerials and siting. As a business proposition, there is nothing attractive about it. Competition at the moment for both business and listeners is so great that no one would be likely to make life harder if it could be avoided.

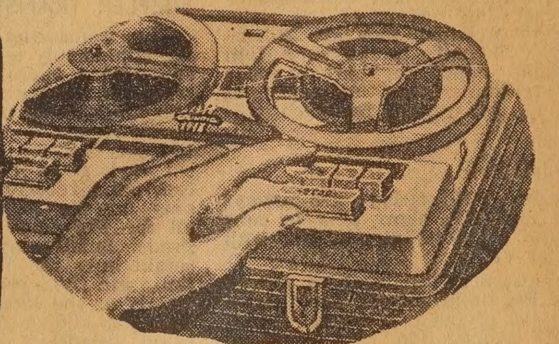
Moreover, the Broadcasting Con-

GRUNDIG

TWO SPEED "Reporter"

The World's Finest Tape Recorder!

brings you the magic of PRESS BUTTON CONTROL!

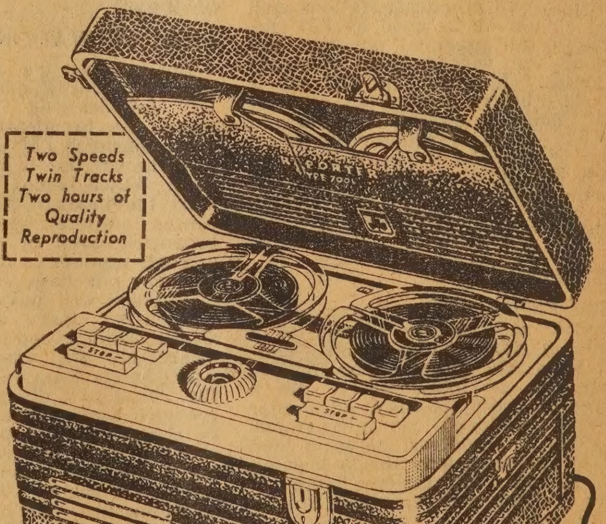


✻ **Exclusive "Grundig" Press Button Control is so magically simple, so quickly efficient, that you obtain at the touch of a button instant mastery of both perfect recording and perfect reproduction! Not only this, but two continuous hours of recorded music or speech on every reel, plus features and performance no other instrument can offer! No wonder "Grundig" swept the market overseas . . . is now first choice of world-famous musicians, professional and business men, lecturers, radio and stage artists!**

NO OTHER TAPE RECORDER can give you all these necessary features!

- TWO SPEEDS: TWIN TRACKS!
  1 hour (at 7½in per second) for high-fidelity music of broadcasting studio standard of reproduction.
  2 hours (at 3¾in per second) of faithful distortionless speech reproduction, or 2 hours of music of normal reproduction quality!
- LIFE-LIKE SOUND. Frequency range 50-10,000 c.p.s. on high fidelity 7½in per sec. speed: 50-6000 c.p.s. (3¾in per sec. speed).
- PRESS BUTTON CONTROL. Utter simplicity of operation makes anyone an expert immediately!
- "MAGIC-EYE" RECORDING LEVEL INDICATOR.
- TONE CONTROL FOR TREBLE AND BASS EMPHASIS.
- FAST FORWARD AND REWIND. No tedious waiting.
- CONNECTIONS for recording from: .. RADIO .. RADIOGRAM PICK-UP ● REMOTE CONTROL—AND FOR PLAYING THROUGH: Additional Amplifiers, Radio Sets, Public Address Systems, Earphones, Extension Speakers.
- UNIQUE CONDENSER MICROPHONE faithfully collects every sound, the subtle characteristics of every voice and each note of music.

Available from leading Tape Recorder Specialists and Radio Retailers, or contact the Australian Agents for name of your nearest stockist.



Two Speeds
Twin Tracks
Two hours of
Quality
Reproduction

RETAIL PRICE **150gns.**

Australian Agents:

GOLDRING ENGINEERING (AUST.) PTY. LTD.

57 H.E. AREA, ST. MARYS, NSW. 'PHONE BO701—Ext. 447

trol Board has now agreed to an increase in power for the major commercial stations up to 5 Kw. Properly used, this will so improve their present coverage and the general quality of their signals that they are not likely to see any attractions or benefits from FM.

PRESTIGE OF TV

There might be some commercials who would value the prestige angle of an FM channel, and it is probable that they would be granted permission to commence one if they desired it. They would operate on the principle that if a few stations used FM, receivers might gradually become available, and the thin end of the wedge gives them a valuable start if the cat jumped that way, as some day it might.

If this did happen, there might easily be a mad rush for FM and a sudden change of heart, but I am not inclined to think this will happen for many a day. If there is any mad rush, TV will be responsible for it.

FM RECEIVERS

As is quite obvious from all this, no one can hear an FM station who hasn't a receiver. At the moment, there might be one or two specialised sets for sale which have an FM tuner, but even that is doubtful and they would probably be suitable only for the existing FM experimental stations.

At any rate it is safe to say that no manufacturer has seriously developed a receiver for FM transmission. They have made receivers for FM, but the vast majority have been the sound channel for a possible TV set, which has reached the prototype stage and even further in more than one factory.

The importance which research laboratories owned by the large receiver firms are placing on TV makes it unlikely that they would welcome splitting their efforts and resources on a new project. They would feel, too, that their next big sales push is likely to be TV, and that the public would be most unresponsive to pressure to buy sets to listen to a few FM stations.

From the listener's point of view, FM would pose him with some very difficult problems. It can, I think, be taken for granted that the present broadcast receiver will be essential as long as there are stations to be heard. Some day he hopes to have a television set which will no doubt absorb a good deal of his ready money. But an FM set would operate on a third frequency band and require him to invest in yet a third piece of equipment. This I do not think he would be prepared to do.

USE OF TV SETS

There is a possibility here mentioned in the Broadcasting Board's latest report, which is the extension of television tuning range to cover FM transmitters. It is quite practicable to use a TV set, which has both sound and sight channels, to receive only sound, and this would solve the problem of the third set.

But, obviously, this course presupposes a TV receiver, and at the moment it is not possible to have any definite ideas about TV and its availability. Until it is, such a solution will have to wait its turn.

It is often suggested that converters can be used for FM reception, attached to a normal broadcast receiver. Apart from the fact that converters have never been accepted by the public as a permanent solution to listening, or even a temporary one, such a converter would, of necessity, be the entire tuning section of an FM set, the most difficult part to make.

If the advantages of high musical quality are to be realised, then the portion of the broadcast set which would be used — the audio end—isn't good enough for the job, I cannot think there is any real stability in a scheme which calls for converters.

The outlook of a company which starts up initially on FM would be particularly bleak. Unless many of the difficulties I have mentioned can be solved in a hurry, he would have virtually no listeners. His lot would be particularly hard in the country, where people place great importance on being able to hear many stations, as they can at the moment, from which to select a good signal. No one is likely to pay a goodly sum for a receiver to hear a single local FM station.

To break the FM deadlock would really need say half a dozen stations in the city area to commence operations together, guaranteeing both public and set manufacturers' superior programs for a sufficient time to get going. There would have to be some arrangement so that the popular sponsored shows could be heard there so that no one would miss out on their favorite sessions. Even then, extra attractions would be needed to convince set buyers that they were getting their money's worth.

On the whole, the prospect of being able to capitalise on the PMG's announcement to make FM licences available commercially doesn't seem to hold many attractions at present. Not because FM is no good, but because the background of the present broadcasting scene throws in too many difficulties. This has been the reaction of several spokesmen for Sydney broadcasting stations, who are well-equipped to make an assessment, and who, I feel, would not welcome such a change at the moment when their own plans for expansion plus the prospect of TV have to be considered.

NEW IDEA IN PAGING BY RADIO

Available in America is a new form of radio paging which enables a subscriber to listen for personal calls broadcast at frequent intervals with the help of a simple receiver carried in the pocket.

THE subscriber is supplied with one of these devices which weighs only 6oz and measures about 8in x 2in x 1in. This he carries with him on the daily round.

Anyone wishing to contact rings through to the Aircall Radiopaging office and asks that a call be sent out through the company's transmitter.

The call takes the form of a private code number which is repeated with others in numerical sequence at least once every 60 seconds.

Every now and then the subscriber takes out his little set and listens. If he hears his number called he contacts his own home or office by telephone. The paging company is then advised that the call has been answered, and his number is eliminated from the sequence of those going out over the air.

WORKS ON VHF

The receiver obviously operates on a VHF or UHF band, probably one of the bands set aside for citizen use. This would account for the very small aerial rod which projects from the top of the case. Operation is confined to an on-off switch and an earphone at the bottom of the case. Being self-contained, batteries are used for power. Subminiature valves would be the obvious choice.

The service costs 12 dollars per month and the receiver is included in this charge. In the event of failure the set is returned for repair and maintenance at no extra cost and is exchanged for a new one. Batteries are supplied free.

The paging company claims that the idea is proving invaluable for doctors and others likely to be required frequently and at short notice. Range is quoted as being about 30 miles and in some cases even farther than this.

The Aircall is a small UHF receiver with rod aerial. Batteries and earpiece are at the bottom of the case which is held in the hand. It receives personal call numbers from a base transmitter.

SPECIALS FROM THE AUDIOTORIUM

High Fidelity Sound Centre

ML 20-5A HIGH FIDELITY AMPLIFIER

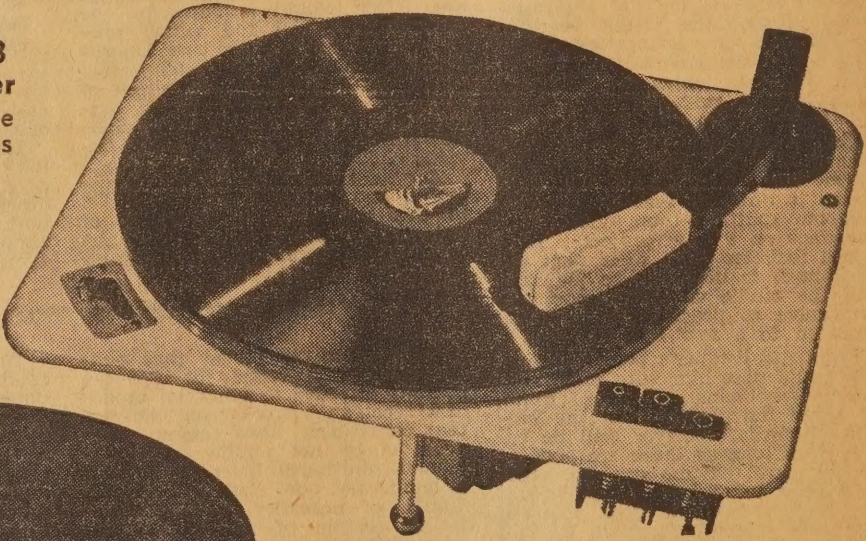
With the new improved Fidelity Control Unit

£69/17/6

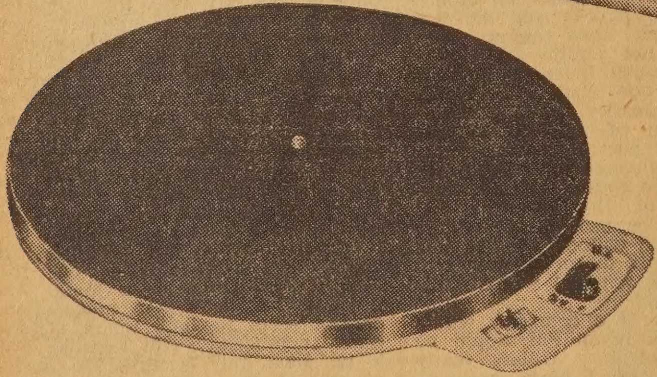
Fidelity
Control

THORENS

AUDIOMATIC CBA 83
Automatic Record Player
with G-E Variable Reluctance
Pick-up and Sapphire Stylus
£46/15/-



E53-PA
PRECISION
TURNTABLE
£30/2/6



NOW AVAILABLE

Ferrograph model 2A tape recorders, Quad II Amplifiers, Leak Amplifiers, Barker loud speakers, Wharfedale loud speakers, M.B.H. pick-ups.

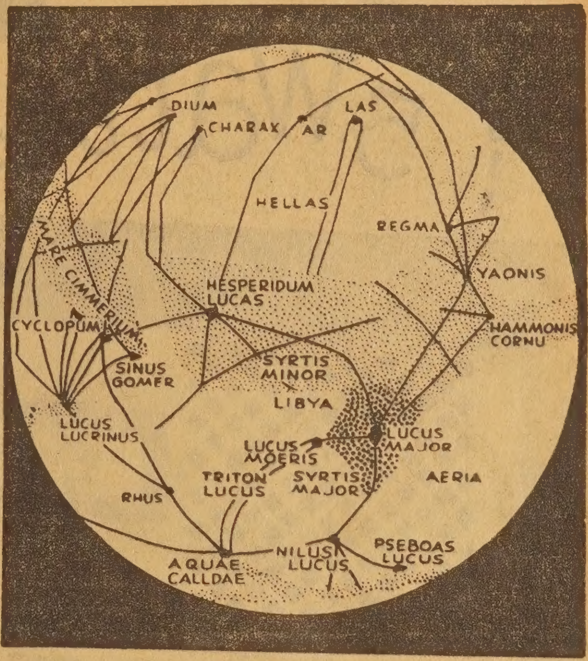
THE AUDIOTORIUM

A Division of Audio Engineers Pty. Ltd.

422-4 KENT STREET, SYDNEY **'PHONE: BX6731**

DO MEN GROW BEARDS ON MARS?

Do people live on Mars? Are the strange lines and markings visible on the surface of the planet really canals, as claimed Schiaparelli in 1877? Soon we may know for certain when observations are made in July of this year.



These lines are what some scientists believe are canals on Mars. The black spots at conjunctions of some of the canals look like green oases through the lens of a telescope.

DURING that period, Mars at its closest will be only 40-million miles away between the earth and the sun.

The next chance will be in 1956 when the distance will be only 35-million miles, but not until 1971 will another good opportunity come around. The orbit of Mars is "off-centre", which accounts for its unusual variation in distance from the earth.

Plans are being made to attach a motion-picture camera to Mt. Wilson's 100in. telescope, the second largest in the world, and no doubt others will be making similar observations.

It's interesting to recall a few facts about Mars. Mars is a planet and revolves around the sun like the earth. Because it is one and a half times farther away, it receives as a result about half as much energy, and should have a lower surface temperature.

TEMPERATURE VARIES

In daytime this might be up to 85 degrees, but rapid night cooling could reduce it to 50 below zero. Rather hard on the inhabitants, if any! It has an atmosphere, but a thin one, and heat radiation is, therefore, easier than on the earth.

The content of atmosphere can be estimated by many tests including light analysis. There seems to be plenty of carbon dioxide and some water vapor but no oxygen.

Mars has a diameter of 4000 miles, and contains only one-ninth as much material as the earth. The pull of gravity is only four-tenths as great—a 200-pound man on the earth would weigh only 76 pounds on Mars. The thin atmosphere has a pressure of only one pound per square inch as against 15 pounds on the earth.

Mars revolves around its axis like the earth, and both sides can, therefore, be seen and studied. A Martian day is about 37 minutes longer than ours. In 1877 two moons were discovered—tiny satellites.

Is there life on Mars? It is fairly certain we ourselves couldn't live there unless fed with artificial air, protected against the cold, and enclosed in pressure suits.

MARTIAN SEASONS

Normally, Mars has a reddish color, which seems to change with possible seasons. The color darkens and a green belt appears until it encircles the planet. At the same time, white areas which seem to be ice polar caps, change greatly in size with the passing of the "seasons".

At one time the big, colored sections on Mars were thought to be oceans, but this idea is not held today as no light reflections have been observed such as would be inevitable from vast expanses of water.

Biggest bone of contention about Mars is the origin of a vast network of lines on its surface. Schiaperelli who first saw them called them canals, and thereupon started keen discussions among astronomers and laymen as to how they came there. Many contended that the canals by their nature were obviously artificial and that someone must have dug them. The fact that some appeared to be in pairs made this idea more feasible.

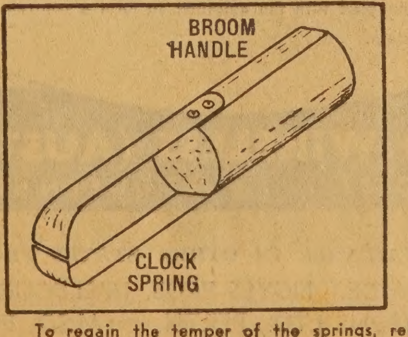
Assuming the canals were dug by intelligent beings, what would they be like? The nature of the planet means they could not be like humans for they would be just as unable to live normally on the earth as we on Mars. The science-fiction writers and artists have always had a happy time building up possible solutions, but few astronomers would give much credence to their ideas.

The truth is we just don't know what these markings on Mars really are, and many competent observers have never been able even to see them.

At the best they are visible for only a few seconds at a time and appear to have a greenish color, consistent with their being water-carrying ducts. The visual contrast between them and the surface of Mars in only about 5 pc which makes them very hard to see.

At any rate, astronomers are hopeful that with their incomparably better telescopes and other aids, they should be able next July to add considerably to our knowledge of Mars. It might even be that the results of their work will establish definitely whether there is any animal life there, and whether these strange canals are accidental, "Martian" made, or just optical illusions.

STRIPPING INSULATED HOOK-UP



For insulation stripper that will bare the ends of any size insulated wire cut a 4" length of broom handle and plane flat two opposite sides.

Heat two 4" lengths of heavy clock spring and allow to cool slowly so that the springs are softened and easy to work.

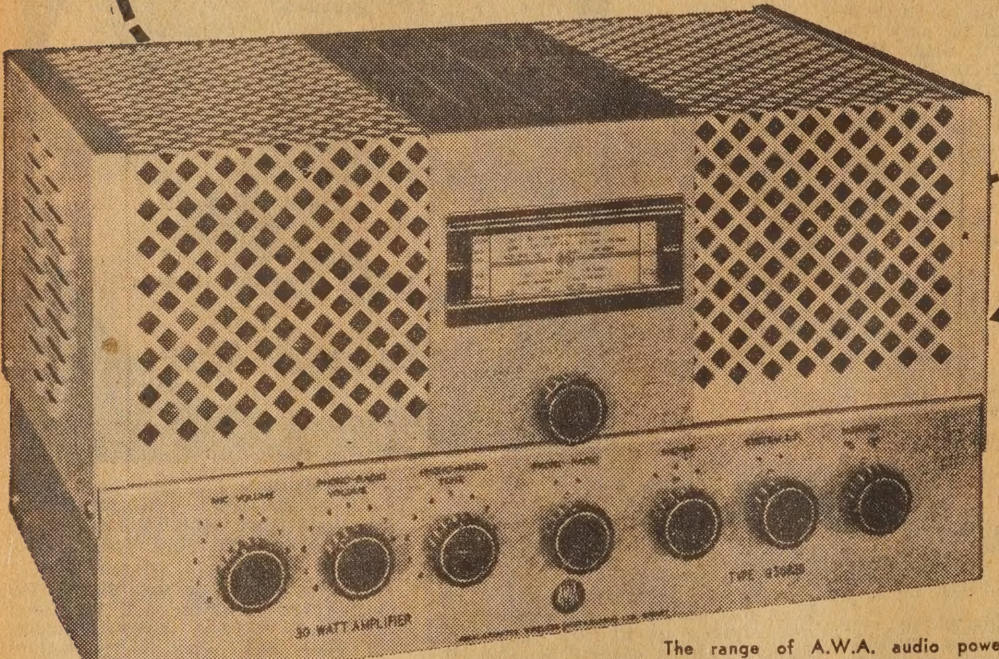
Drill two small holes at one end of each spring so that later on they can be attached with wood screws to the handle. Now bend the other ends at right angles and grind a knife-like edge on each.

While bending and grinding these ends, arrange it so the edges have a small gap between them, when assembled.

To regain the temper of the springs, reheat and plunge them in oil. Attach the springs to the handle and this handy stripper is complete. (J. M. Arncliffe, N.S.W.)

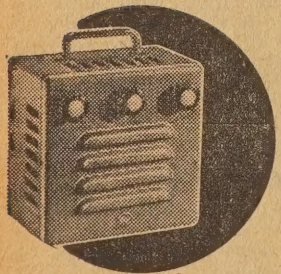
AWA PUBLIC ADDRESS AMPLIFIERS

5 Watt to 70 Watt



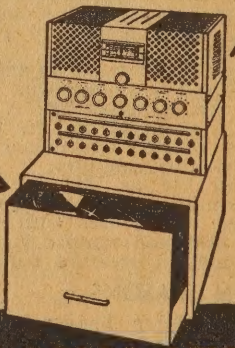
The range of A.W.A. audio power amplifiers provides a type for every purpose, incorporating features and facilities to meet every need in sound amplifying and distribution.

Designed and built to the same high standards of quality workmanship and performance for which the Company has established a world-wide reputation in broadcasting and communication equipment, models PA825 15 watt, PA826 30 watt and PA827 70 watt are illustrated above with radio tuner PA831 fitted. The amplifier protective cover has provision for mounting a monitor speaker.



5 watt portable amplifier type PA806 provides ample power for the needs of most indoor gatherings and many outdoor applications.

Radio, record playing, and speaker switching units assembled with the amplifier to form a centralised system.



AMALGAMATED WIRELESS (AUSTRALASIA) LTD.

47 YORK ST., SYDNEY. BO233. 167 QUEEN ST., MELBOURNE. MU9161

AVAILABLE IN OTHER STATES FROM

NEWTON McLAREN LTD., ADELAIDE. NOYES BROS. (MELBOURNE) LTD., HOBART. CHANDLERS PTY. LTD., BRISBANE. NICHOLSONS LTD., PERTH. ALSO FROM LEADING WHOLESALERS.

ELECTRONIC JUDGE'S WORD FINAL

A simple yet effective "Electric Judge" has been evolved by a New Zealander for determining place-getters in closely contested athletic events. Most recent use was for judging woodchopping events at the Sydney Royal Show.

THE inventor of the Electric Judge, Mr. S. J. Samuels, has had a longstanding interest in the judging of sporting events and has observed both the fallibility of human judges and of onlookers, who are sometimes prone to contest their decisions.

Worried by such disputes, when secretary of a sporting body, Mr. Samuels set out to devise a simple electrical device which could be arranged to register automatically the order in which competitors completed a particular event.

The principle of the Electric Judge is very simple. A ring of electromagnets is supported on a platform above the mouth of a funnel.

FREE TO MOVE

Iron cores in the magnets are free to slide through the coils, but normally rest with their tips protruding through the coil and over the lip of the funnel.

A circular cage is provided which holds a number of balls around the edge and over the mouth of the funnel. The balls cannot normally fall, however, because they are supported underneath by the tips of the magnet poles.

When a magnet is energised, the pole tip is momentarily withdrawn, and the ball falls through into the funnel.

The apex of the funnel is large enough to pass one ball at a time and leads down into a skeleton tube at the bottom of the unit. The balls are colored or numbered for identification and the placings in an event are evident from the order which the balls occupy in the collector tube.

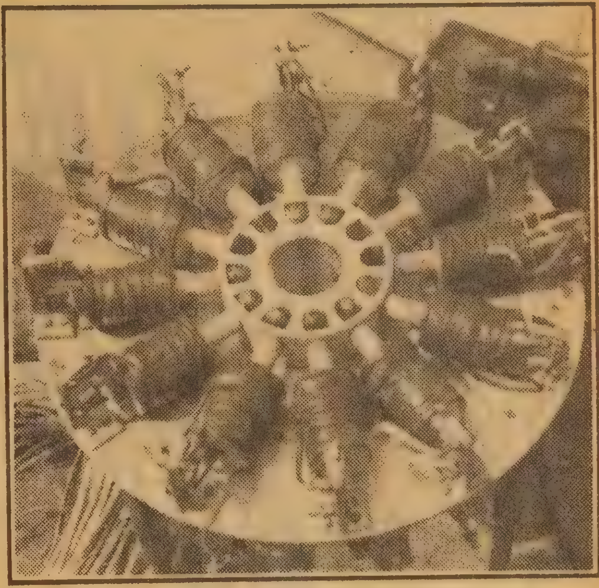
By careful machining and adjustment to keep the corresponding parts of each section identical, it is possible to achieve a high degree of precision and the machine has shown its ability to register placings which, to the eye, are "dead heats".

METHOD OF TESTING

A simple method of checking is to arrange a series of cottons radiating from a single support to a number of microswitches, each connected to its respective solenoid. By cutting the cottons near the apex of the fan with one movement of a pair of scissors, the machine should —and can—register the exact order in which the cottons have been severed by the scissor blades.

The inventor claims this to be equivalent to a timing accuracy of about 1/100th second.

In judging footraces, &c., the simplest course is to have each competitor run in a separate lane, and to break a fine thread as he flashes over the finishing line. This can readily be arranged to operate a solenoid and release a ball corresponding to the lane number.



A closeup view of the electric judge, showing the solenoids arranged in a circle around the edge of the funnel. Some of the balls are shown in position ready to be released by movement of the core.

For timing woodchops, the judge was initially operated by having the competitors step on to a platform or otherwise operate a contact immediately on finishing their cut. This proved unsatisfactory, however, because with the severing of the log, competitors often fell or jumped away from their contact or forgot about it altogether.

Mr. Samuels holds the tube which contains the balls in the exact order of their release by the solenoids.

A great many schemes have been tried in an effort to achieve reliable and automatic triggering of the solenoids.

In the early stages, schemes which relied on the sag of the severed log to operate contacts proved unreliable because of the variation in logs and stands.

An idea of having a metal spike in the log centred in a ring, supported from the ground, failed because it was too sensitive. Movements of the log would often allow the ring and spike to touch, giving a false impulse before the log was accurately cut through.

ROYAL SHOW

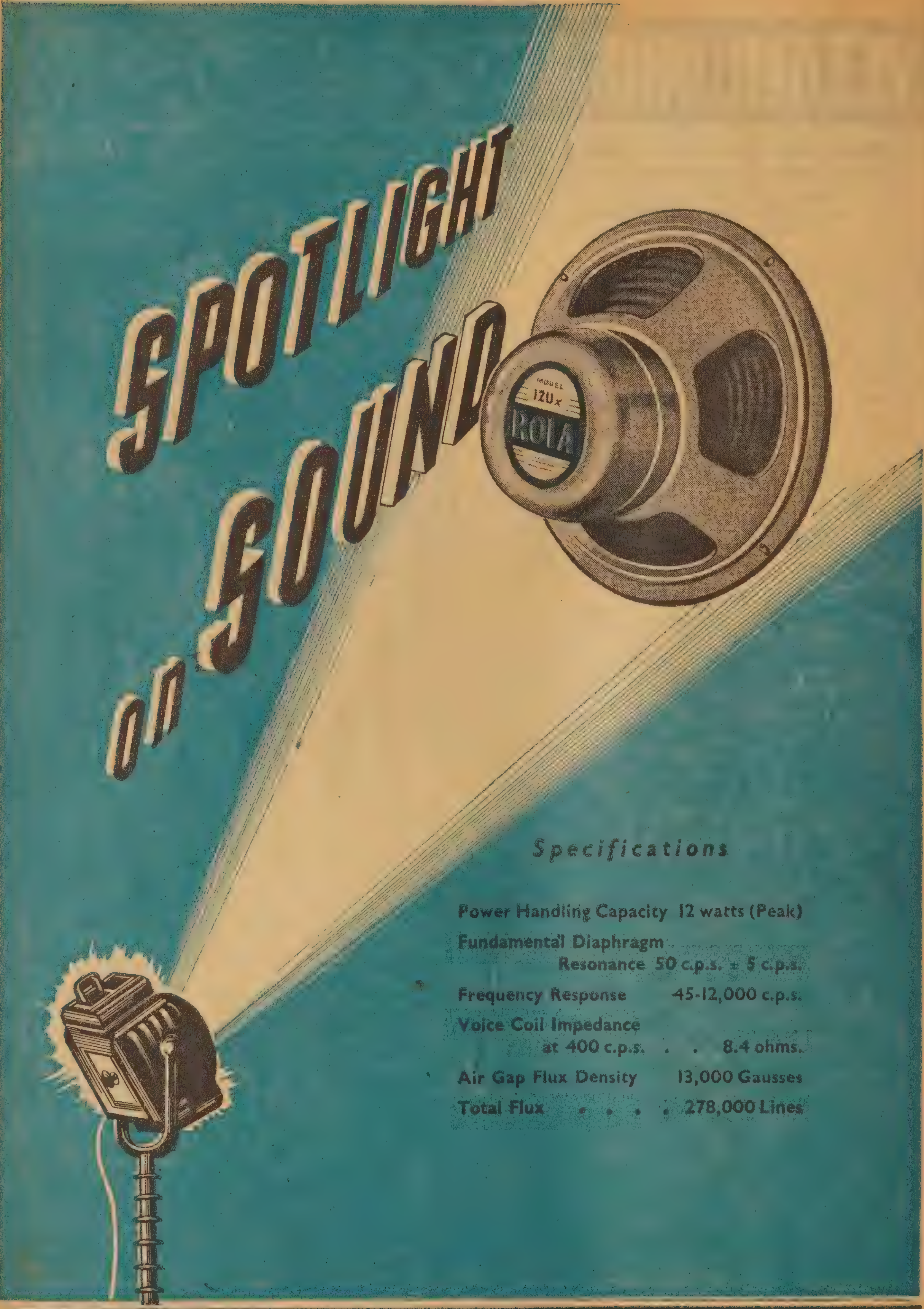
The system adopted for the Sydney Royal Show involves driving a spike into the end of the log, parallel with the ground. A short length of chain slipped over the end of this spike holds off the ground a flat spring, which is wedged by its other end beneath the log cradle.

Beneath the raised end of the spring is a contact, resting on the ground, while the spring itself provides the return path.

When the log is severed, it can no longer maintain tension on the spring, which then flies down to touch the contact beneath it and close the electrical circuit. All circuits are energised from a single 12-volt battery.

For standing block events, contacts are fixed to the top of the block and held apart by a leather tab attached to an overhead cable.

When the top of the block is severed and falls away, the tab is pulled from between the contacts, allowing them to close and trip the circuit.



Specifications

Power Handling Capacity	12 watts (Peak)
Fundamental Diaphragm Resonance	50 c.p.s. ± 5 c.p.s.
Frequency Response	45-12,000 c.p.s.
Voice Coil Impedance at 400 c.p.s.	8.4 ohms.
Air Gap Flux Density	13,000 Gausses
Total Flux	278,000 Lines

ATKINS (W.A.) LTD.
894 Hay Street, Perth. W.A.
HOMECRAFTS PTY. LTD.
290 Lonsdale Street, Melbourne, C.1.

W. & G. GENDERS PTY. LTD.
53 Cameron Street, Launceston, Tas.
HOMECRAFTS PTY. LTD.
100 Clarence Street, Sydney, N.S.W.

A. E. HARROLD
123 Charlotte Street, Brisbane, Q'land.
VEALLS AGENCIES PTY. LTD.
490 Elizabeth Street, Melbourne, C.1.

A. G. HEALING LTD.
151 Pirie Street, Adelaide, S.A.
AND ALL LEADING WHOLESALERS.

METALS STRONGER BY 100 TIMES

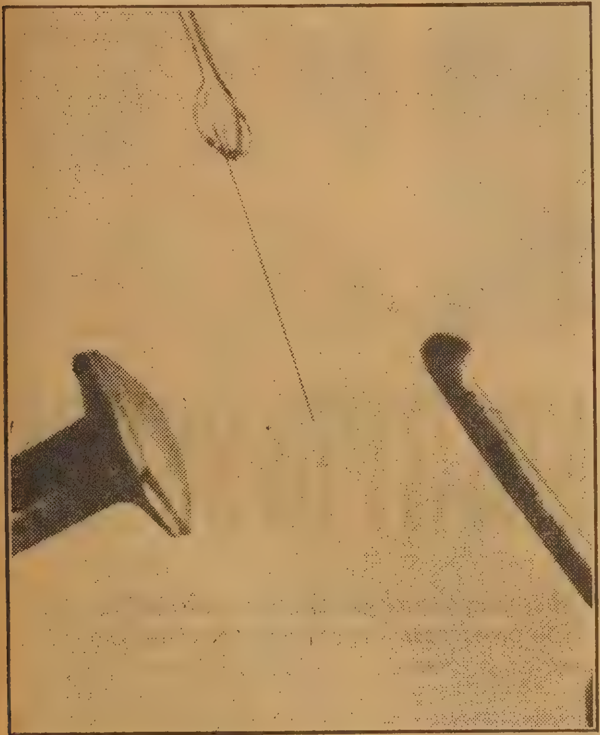
The General Electric Company's top research official has recently disclosed the development of perfect crystals of pure iron 100 times stronger than any known metallic crystal and inherently resistant to rust.

EXPLAINING crystals as the building blocks that make up metals and alloys, Dr. C. G. Suits, vice-president and director of research, said the perfect crystals represent for the first time metals that are as strong as theory predicts they should be and, as such, "provide a new and exciting dimension in metallurgy".

He described the crystals as metallic whiskers about one-thousandth of an inch thick and an inch or so in length.

He said they were produced in the company's Research Laboratory in Schenectady, New York, by Dr. Robert L. Fullman and Arno Gatti.

A perfect crystal of pure iron, stronger than any known metal or alloy, is studied under the microscope by Dr. Robert L. Fullman, metallurgist in the General Electric Research Laboratory.



A perfect crystal of pure iron, a hundred times stronger than any previously known metallic crystal, is shown as viewed through a microscope. The crystal, a "whisker" a thousandth of an inch thick, is seen between an ordinary pinhead (left) and a tiny tool for manipulating.

"No one knows today how to put these perfect crystals to practical use," he said. "We certainly cannot use them to support a suspension bridge. But their discovery is very recent. In time, applied science and technology will find a practical use for this form of metal."

According to the G-E official, the first observations of metallic whiskers were made at the Bell Telephone Laboratories. Telephone relays under test were found to fail in a mysterious manner, and research showed that whiskers of tin had grown and caused a short circuit.

Steel in machines and copper in electric motors, like all metals and alloys, are aggregates of crystals, so most problems of metals revert to problems of the component crystals, Dr. Suits pointed out.

One of the most important properties of metals and their alloys has to do with strength. He explained that metallurgists have calculated the theoretical strength of iron crystals to be such that one an inch square should support a million pounds or more. It has been a mystery why the strength of actual crystals is a hundred times or so less than this. Metal parts used in machinery and other equipment similarly fall far short of the strength they might theoretically have.

Dr. Suits said that scientists have recently found that crystals previously made, thought to be nearly perfect, actually had atomic irregularities on an atomic scale. These defects caused the weakness.

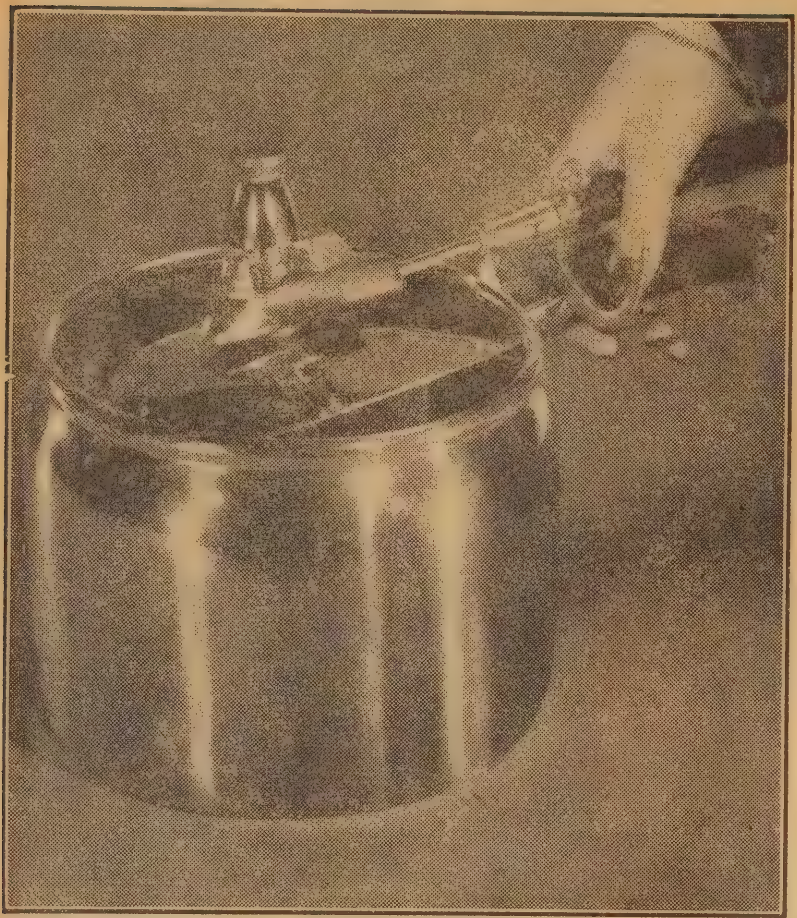
"Now that we have learned to make some really perfect crystals for the first time, we find that they have astounding strength," he said. "They are stronger than any previously known metal or alloy, and actually attain a tensile strength of nearly a million pounds per square inch."

Moreover, he added, these tiny perfect crystal wires of pure iron do not appear to rust. Finely divided iron, or fine wires of ordinary iron, rusts almost immediately upon exposure to air.

"The same atomic perfection that gives them strength prevents oxidation," he explained.

In order to test the strength of these iron whiskers they are viewed under a microscope as they are bent by means of a micromanipulator. This is a device which makes possible small and accurately controlled movements. From the amount of bending they will withstand, their strength may be calculated.

AT the speed of sound, a pilot would have to exert 5700 pounds of pressure on a modern fighter's control stick to overcome airstream forces if the plane were not equipped with a hydraulic boost system.



The pressure cooker is a simple example of the usefulness of pressure in everyday life. It indicates a process which has been important in the formative history of the earth and other members of the universe.

THINGS HAPPEN UNDER PRESSURE

Among the many means which scientists have of changing the physical nature of matter one of the most interesting is that of using extremely high pressures. The same process has played an important part in organising the shape of matter in the universe as we know it.

by Calvin Walters

IT seems the fashion nowadays for scientists to try to outdo nature by delving into the structure of matter, seeking, in some way, to find just how nature arranges things, hoping thereby to gain the knowledge which will enable us to be a few jumps ahead of nature herself.

We witness the splitting of the atom, the manufacture of new elements, and the rearranging of the molecules of a substance to make synthetic materials of a wide variety.

COMMON EXAMPLES

Scientists use such methods as superheat and sub-freezing. They explode, they split, they use radioactivity. They melt and dissolve and now they use extreme pressures.

In our ordinary everyday life we do not think of pressure as having any great importance, except that which we use in pressure-cookers and motor car tyres. To our mundane existence, temperature seemingly plays a much more important part, for it is by heating or freezing (or at least cooling) that makes for most of our comforts.

About the only importance we attach to cooking in a pressure-cooker is the fact that water under pressure has a higher boiling point than water not under pressure. The water therefore becomes hotter, thus cooking the food in a fraction of the time normally required.

SCIENTIST'S OUTLOOK

The fact that water can be frozen by the application of pressure and that seven different kinds of ice can be produced by this method is not of great importance to the layman. He is only interested in the fact that ice is cold, and he doesn't want seven different kinds of ice anyway! All he wants is to keep his lemonade or what have you cold in the hot weather.

To the scientist, however, these facts are of great importance. They may prove to be very valuable in years to come by their application to new processes which will add to the comforts of everyday life.

Atmospheric pressure is the pressure exerted by the column of atmosphere on a surface of area of one square inch, and is approximately 15lb per square inch. This is the pressure under which all our normal activities are carried out.

OCEAN PRESSURES HIGH

And variation from this normal pressure has obvious effects, whether it be on the weather, in a steam boiler or on our rheumatism.

At the bottom of the ocean the pressure, at a depth of six miles, is approximately 1000 atmospheres, or 15,000lb per square inch.

Strange as it may seem, although our normal lives as human beings are lived under a pressure of 15lb per square inch, all except about 1 pc of the matter in the whole universe exists under pressures exceeding 1000 atmospheres.

Within the stars, pressures are very high — brought about by the extreme temperatures generated within them. Under these conditions of this heat and pressure, great transformations are taking place continually within the matter of which the stars are made.

It is quite possible that these transformations have an effect of great magnitude on the nature of things around us. It is therefore not surprising that man should try to duplicate the processes taking place within the realms of nature, thereby attempting to discover what makes the universe "tick".

SIMPLE APPARATUS

It is now a practical proposition to achieve pressures of 100,000 atmospheres. This is 1,500,000lb per square inch. It would be excusable if one should think that the apparatus for achieving such immense pressure must be most complicated. Such is not the case, however.

Most, if not all, apparatus for this purpose makes use of a hydraulic system of some kind. Mostly it is simply a piston in an extremely strong cylinder.

Neither is the apparatus necessarily very large. Most of the experiments have been carried out with a cylinders only 1.6 millimetres in diameter and 8 millimetres long.

This cylinder has very thick walls and within the cylinder a piston is placed which has a very ingenious packing to prevent leakages of the fluid past the piston. This packing is so arranged that the greater the pressure exerted, the tighter the pressure of the packing against the walls of the cylinder. It, therefore, cannot leak.

In the design of the apparatus steels of high quality must be used and, during the early investigations, some facts were brought to light which were quite contrary to those commonly accepted.

For instance, it was found that cylinders with thick walls broke under pressure from the outside and not from the inside, as commonly thought. This was found to be due to the fact that the internal pressure merely served to compress the steel at the point of pressure contact so that the stresses and strains are concentrated at the inner surfaces and the outer parts of the metal do not sustain their proportion of the load in supporting the pressure. Thus the outer portion is the first to give way.

WALL THICKNESS

This is the main reason why increasing the thickness of the walls of the cylinder does not enable unlimited pressure to be gained.

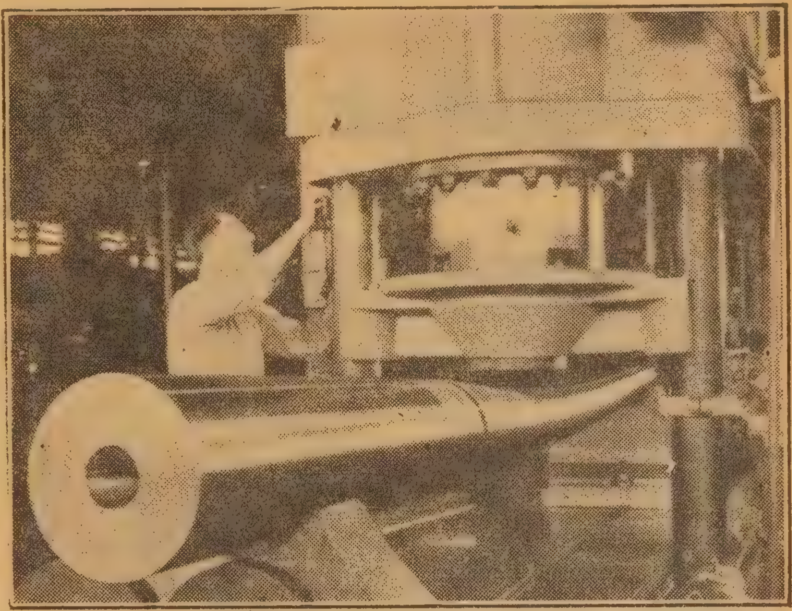
It has been found that a pressure limit of 15,000 atmospheres is reached in the thickest walls of the best heat-treated steels. Even with steel bands shrunk around the outside of the cylinder walls, the pressures to be obtained are only in the region of 30,000 atmospheres.

This is not all the story. The piston moves down in the cylinder by means of a hydraulic press applied to the end protruding from the cylinder.

The piston, being also made of metal, reaches a limit of strength. The greatest compressive strength of the best steel available is about 30,000 atmospheres. Thus this is the greatest pressure which any piston made from these steels can stand without fracture.

A new steel alloy called "carbaloy" is now used for the piston. This has a far greater breaking strain. In addition to this, a very ingenious system has been devised which has enabled pressures of 100,000 atmospheres to be obtained.

A BIG PRESS DOES A MIGHTY JOB



A man sized job is done by this giant press shown here straightening a big gun barrel.

This system makes use of another vessel in which a liquid is maintained at a pressure of some 25,000 atmospheres. Into this vessel the pressure apparatus is immersed. Thus, the outside of the pressure apparatus is supported by a pressure of 25,000 atmospheres all over.

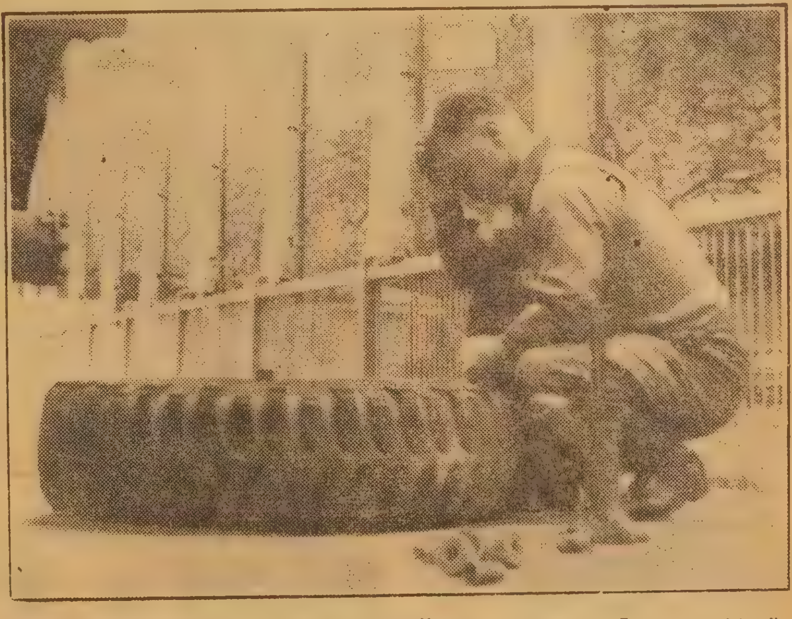
THEORETICAL LIMITS

It is, theoretically, possible to extend the pressure range indefinitely by having a nest of vessels, each one of which has an increasingly higher pressure supporting the other within it. Up-to-date, no method has been found to construct other than the first of the series of vessels.

Under these extremes of pressures of 100,000 atmospheres the problem of leakage of the liquid past the piston disappears for the reason that at these pressures all usual liquids and gases are frozen solid. Indeed, all elements which are ordinarily gaseous, freeze solid at a pressure of 50,000 atmospheres.

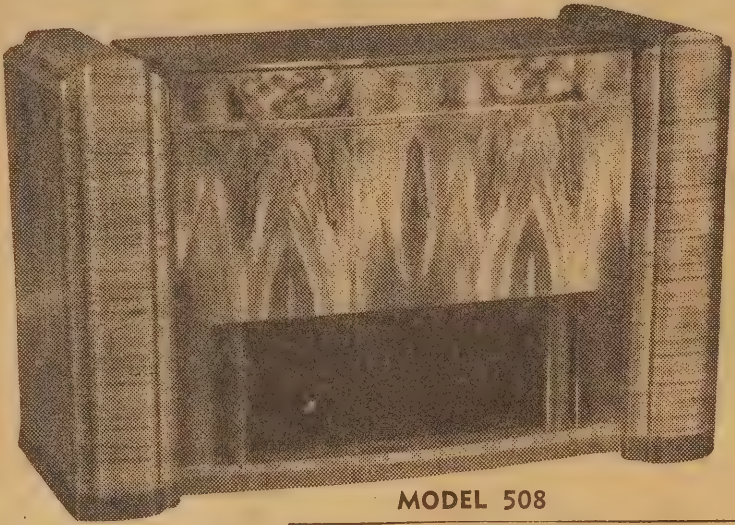
The exception may be helium but even this, it is believed, freezes at a pressure below 100,000 atmospheres.

The effects of pressure on the physical characteristics of substances



Pressure and the lack of it makes all the difference to transport. Every motorist will understand this man's point of view!

AUSTRALIA'S FINEST SELECTION
OF
Cocktail and Radiogram Cabinets
Slade's Radio Pty. Ltd.



MODEL 508

Makes available to radio dealers and home constructors a full range of cocktail and radiogram cabinets. Made from best quality maple and Italian walnut veneers, finished with a brilliant piano finish.

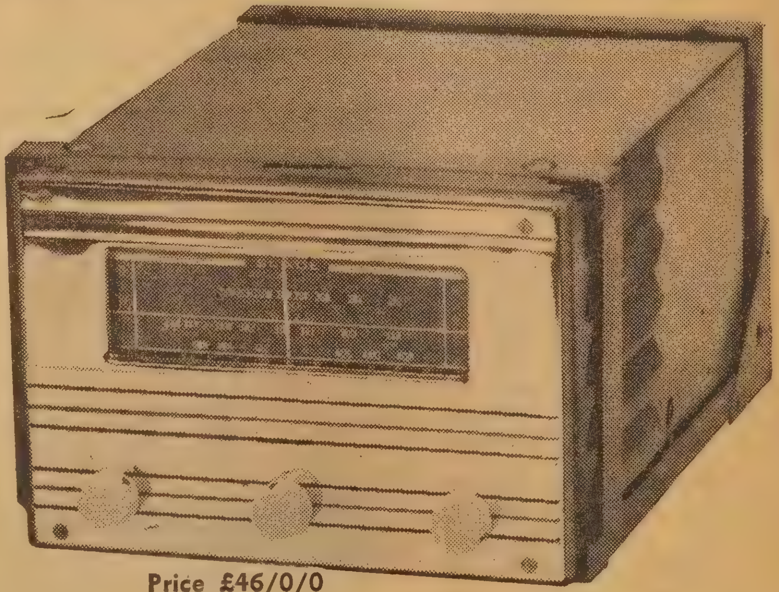
Labrinths available suitable for 12in speakers.

Slade's Radio Pty. Ltd. proudly present their most astounding achievement in 30 years

SLADE'S DUAL CAR AND HOME RADIO

The Slade Dual Car and Home Radio operates from 6 volt, 12 volt, or 240 A.C. Transferred from car to home use in 30 seconds.

Radically new circuits incorporated in its design guarantee it will outperform any other car radio in Australia.



Price £46/0/0

South Australian Distributor: L. Cockburn, 164 Gover St., North Adelaide, S.A.

SLADE'S RADIO PTY. LTD.

LANG ST., CROYDON, NSW.

Tel. UJ5381 — UJ5382

Established 30 years

is, in many cases, contrary to that which has been expected.

When water is compressed it eventually turns in to ice. As the pressure is raised, the expansion which normally takes place when water turns to ice is accentuated and becomes abnormal. The melting point temperature is lowered and continues to fall at an increasing rate. It would seem that this expansion and lowering of the melting point would contiue indefinitely but such is not the case.

VARIETIES OF ICE

At a temperature of minus 22 degrees centigrade and at a pressure of 2200 atmospheres, ordinary ice suddenly turns into a new kind.

There is a reversal of form. Instead of increasing in volume, it suddenly begins to decrease. This continues until the volume of the ice is actually less than that of the original liquid from which it was formed. The melting point also rises.

As the pressure is increased this new ice becomes unstable and is replaced by still another kind with smaller volume and higher melting points. This goes on and on until finally seven different kinds of ice have been discovered, the last of which can be heated to 175 degrees centigrade before it begins to melt. This is formed at a pressure of 45,000 atmospheres.

Of course, in the case of the transition of water into ice the process reverses when pressure is removed and the ice reverts to its original condition—water.

This reversal takes place with most substances, but there are a few instances where no reversal takes place.

These are cases where a substance has been converted into a new form by pressure. The most notable of these is the transformation of yellow phosphorus into black at a pressure of 12,000 atmospheres and a temperature of 200 degrees centigrade. At ordinary room temperature the same transition will take place, but higher pressure is needed in the order of 30 to 40,000 atmospheres.

VISCOSITY INCREASE

At a pressure of 60,000 atmospheres the stable red or violet phosphorus can also be transformed into the black variety.

The chemical carbon disulphide, which is an ordinary highly volatile liquid, is transformed at a temperature of 175 degrees centigrade and a pressure of 40,000 atmospheres, into a solid black mass, which is very much denser than the elements from which it is formed.

In the field of the effects of pressure on liquid it has been established that the viscosity of liquids is considerably increased with pressure. This has an important bearing on lubrication.

The study of the effects of high pressures on materials commonly used in industry is of the greatest importance.

Previous to the present time there has been no really effective method of determining, for instance, the effect of very high pressures on the electrical conductivity of metals.

The changes in the crystalline nature of metals or other solids can be studied very effectively by means of the apparatus described above.

Whether it is possible to break the atom by means of extremely high pressures is, of course, a subject which is used from time to time.

Although it cannot be claimed for certain that nuclear fission can only occur by the methods used in making the atom-bomb, it sems unlikely that the atom could be broken by pressure alone. Pressure can, however, possibly rearrange the electrons in the orbits.

MOLECULAR SQUEEZE

This seems quite feasible, as it is obvious that as pressure is applied to any substance the resultant compression forces the molecules closer together.

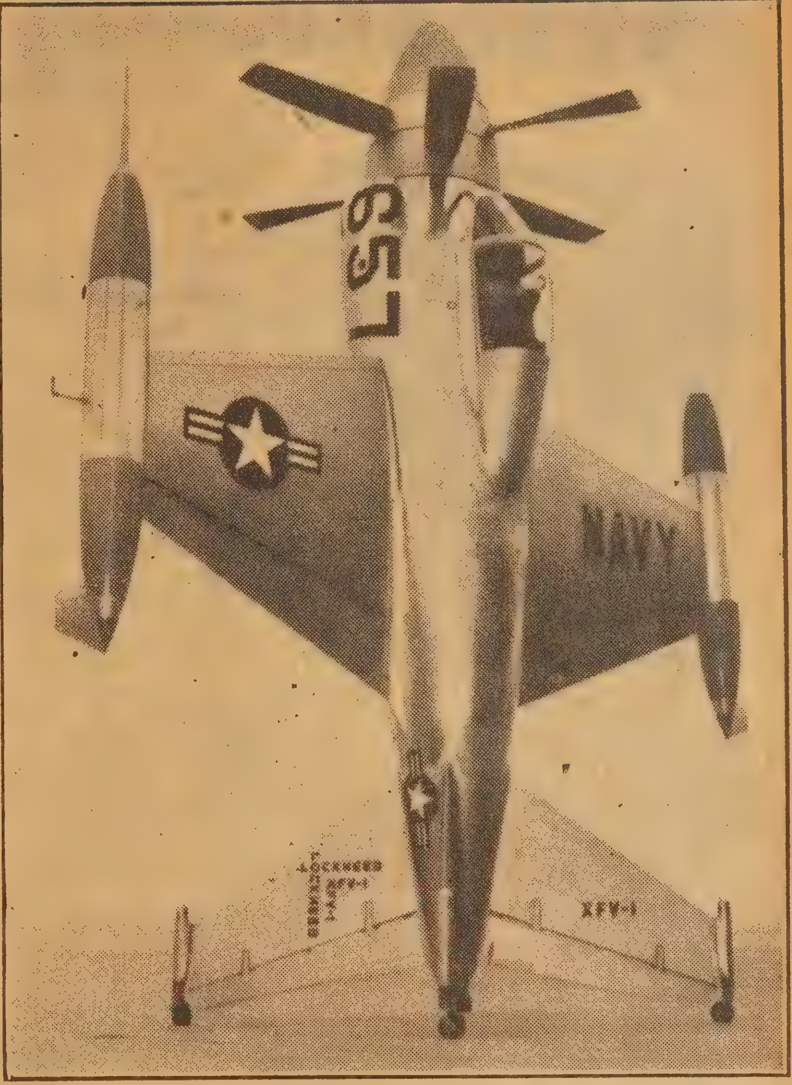
In other words, the spaces of the molecules get filled up until finally the molecules themselves are in contact with each other.

It is thought that once pressures are applied, which are so great as to bring about this state, the final stage, with increasing pressure, must be a deformation of the atom itself.

Pressures of this magnitude have not yet been attained in the laboratory, but pressures of sufficient magnitude have been attained to show that considerable rearrangement of the molecules does take place with a probable deformity of the atom.

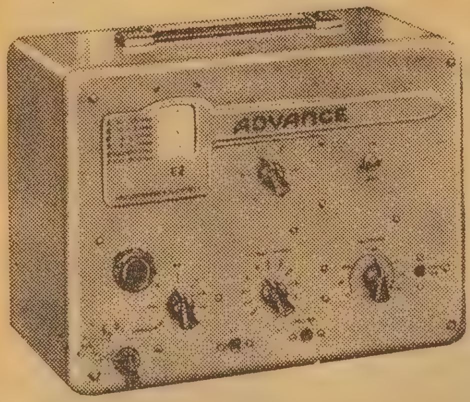
The nucleus of the atom is the part which counts, and in view of its extremely tough nature it is doubtful whether it could ever be burst asunder by pressure alone.

FIGHTER LANDS UPRIGHT ON DECK



This revolutionary aircraft, the XFV-1, has been specially designed to operate from small ships. Its powerful turbines, aided by rockets, are intended to give it a vertical take-off. The pilot's seat rotates as the plane's angle changes and it levels off for flight. At the moment in the experimental stage it can fly at 700 mph as a conventional aircraft but it would not normally be fitted with an undercarriage. Counter-rotating airscrews prevent power torque from turning the fuselage. No information is yet available as to its vertical flight performance.

Advance SIGNAL GENERATORS



R.F. GENERATOR TYPE E2

Range:	100 Kc/s to 100 Mc/s in 6 ranges on fundamentals.
Accuracy:	Frequency calibration plus minus 1%
Modulation:	30% at 400 cycles
R.F. Output:	1 uV to 100mV, continuously variable through 75 ohm matched transmission line. A steady output of 1 volt is also provided through a separate socket. Using the termination pad, output impedances of 37 ohms, 10 ohms, or 10 ohms through a standard all-wave dummy aerial may be obtained.
A.F. Output:	Variable 0-12 volts at 400 cycles.
R.F. Leakage:	Total stray leakage less than 3 uV at 100 Mc/s.

IMMEDIATE DELIVERY

"Advance" Signal Generators are designed and manufactured as precision instruments. The same high standard of workmanship is maintained right throughout the range, from ordinary radio service models to sub-standard types for research and laboratory use. They are widely used by Australian Government Departments and Defence Services as well as industry generally.

The two models illustrated are companion instruments designed to fulfil the needs of radio service and communications engineers and, between them, provide complete radio and audio frequency signal sources for all normal requirements. They are keenly priced and are fully guaranteed.

Write for detailed specifications

A.F. GENERATOR TYPE H1

Range:	15 c/s to 50,000 c/s
Accuracy:	Frequency calibration plus minus 1% or plus minus 1 c/s
Output:	Sine wave—200 uV to 20 volts plus minus 1 db Square wave—400 uV to 40 volts
Rate of rise of square wave:	Less than 3 microseconds to reach 90% of peak value at 10 Kc/s
Distortion:	Less than 1% at 1,000 c/s.

SOLE AUSTRALIAN AGENTS

JACOBY MITCHELL & CO. PTY. LTD.

BX3446 (5 LINES)

Sales and Showrooms, 277 Clarence Street, Sydney.

Made by ADVANCE COMPONENTS LTD., England.

Technical Review

THE PROBLEM OF MUSICAL PITCH — LATEST DECISION

Recently, in London, the International Standards Organisation agreed on a uniform standard of pitch based on a vibration rate of 440vps for the A on the treble staff above middle C. Writing in High Fidelity, James Hinton jun. discusses the vexed question of pitch.

PITCH, apparently, is still, as it always has been, one of those troublesome matters that everyone has ideas about but that nobody seems able to do anything about.

Theoretically, or ideally, pitch should be the same as frequency of vibration, and physicists would be very happy, no doubt, if it were.

You can define frequency exactly, and restrictively, as "the number of vibrations per second described by a sounding body"

In general the numerical value of frequency will be the same as that of pitch—but not always, for pitch is what the ear hears.

MORE THAN FREQUENCY

It has been shown that the position on the scale to which the hearing human animal assigns a given musical sound is not necessarily the position indicated by its frequency, for such factors as amplitude and tone-quality color the judgment.

As early as the first half of the 17th century the French priest Mersenne was experimenting with the causes of pitch sensation and the accurate determination of pitch.

In 1648, he found that the lowest church pitch in use assigned a value of 373.7 cps. to the A that is now officially vibrating at 440, and that the secular, or chamber, pitch was 402.9—roughly equal to pitches between F and G and G and A flat below the present standard A.

In the time of Bach, pitch standards were undergoing a transition, for the improved new French woodwinds were being made to lower pitches than had been used in making German organs.

As a result, the instrumental parts to a good many of Bach's church works show a built-in correction for the discrepancy, with the organ and string parts (the former by necessity, the latter by habit) scored in a key lower than the wind parts.

Since organs of the period were not ordinarily built to equal temperament, the need to compose in practicable keys complicated both Bach's problem and the problem of figuring out, ex post facto, just what pitch values he had in mind for which compositions.

The pitch problem is easier with Handel, who was born in the same year as Bach, since he spent most of his creative life in England and left to posterity a tuning fork he had used during those years.

This fork gives off an A of 422 vps-plus, and since it is known that Mozart's piano was tuned to an A of 421.6 vps, the usual assumption is that composers in the 18th century thought of their music as being performed at an A value of between 415 and 430 vps.

MORE BRILLIANCE

With the 19th century pitch began to rise. In 1813 the London Philharmonic was using an official A of 423.7 vps. Then it bounced up to 452.5, relented to 433 in 1826, and zoomed up again to 455 within the next 20 years. In the US, concert pitch reached even higher—461.6 vps.

The main reason behind this tendency to push pitches up to the sky seems to have been the same one that impels some people to turn the treble up when they play records: The higher it is, the more brilliant it sounds.

The rise in pitch did much to brighten up orchestral concerts and lead to the aggrandisement of conductors; what it did to performers—particularly singers—is another matter.

For example, under the old American concert pitch a soprano singing music by Mozart would have to sing a pitch actually higher than an eighteen-century soprano's high C to reach a tone notated by the composer (and presumably thought of by him) as a B.

The 440 vps standard isn't so bad—quite—but the strain imposed by the rise in pitch is still apparent.

The intervals between B flat and B and between B and C may not look like much, just written out, but they can be as impassable as the Grand Canyon for singers pushed to the extreme limit of their range.

Similarly, although it might not sound bad at all, a fine eighteenth-century violin does not benefit from the extra stresses imposed by the tighter stringing.

Many attempts have been made to bring about some kind of unanimity about pitch and to eliminate dangerous excesses.

The first formal action was taken by a group of physicists, who met in Stuttgart in 1884 and adopted a standard A of—surprise!—440 vps, just like the latest London conference.

Nobody paid much attention, though, and in 1889 an orchestral standard A of 434 vps was adopted (backed by the famous Diapson Normal tuning bar, which, although cherished in a vault at the Conservatoire, turned out to have an actual vibration rate of 435.45; so much for the fallibility of standards). A number of orchestras, including the Boston Symphony, adopted the French figure.

In actual practice, the pitch of most orchestras has a way of varying with the weather, since the oboe is commonly used as a tuning yardstick and reeds are affected by atmospheric changes.

Physicists have talked themselves blue in the face about this, trying to get orchestras to use tuning bars or forks, but they have never made much headway against tradition.

In May, 1939, an international conference on pitch was held in London (does this sound familiar?), and it was unanimously agreed to recommend to all interested organisations the adoption of a 440 vps A.

FAIRLY COMMON

The recommendation was accepted variably, but in the US—aside from conductors' sneaking it up a little now and then—the 440 A is pretty generally recognised.

In order to assist musical organisations in maintaining consistent pitch, the Bureau of Standards broadcasts a 440 vps signal from Washington, but the only orchestra I know of that uses it for concerts is the Baltimore Symphony, which began in 1952 to bring a little receiver out and tune up by the hum from Washington instead of by the oboe.

Just to show that the orchestra has no monopoly on A signals, the management of the National Festival Hall in London has an intermission-recall signal that sounds an A—presumably a 440 vps one, although some orchestras on the Continent still tune to 435 vps or some other value known only to them.

TWO NEW MAGNIFICENT Hi-g

acos

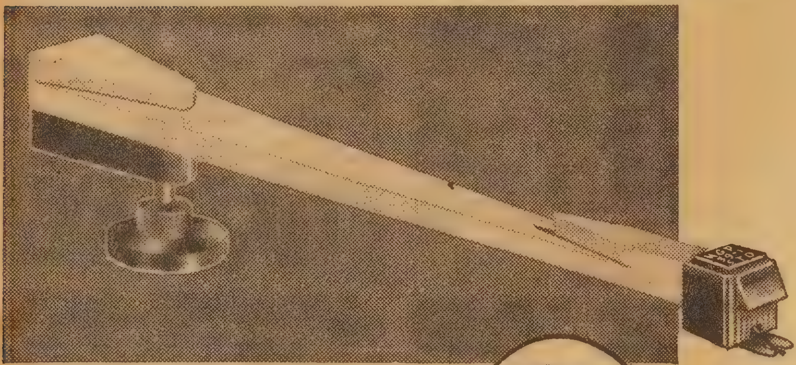
CRYSTAL PICKUPS

HGP40 *Interchangeable Head*

AND

HGP38 *Turnover Type Head*

will track with ease all present day records— and those of the foreseeable future too



HGP40. Price complete, with HGP39 Std. and HGP39 L.P. cartridges

£9/15/-

HGP40 CHARACTERISTICS

Response flat from 40 c/s to 13 Kc/s with an overall response from 20 c/s to 17 Kc/s. Tracking weight 8 grammes.

HGP39-1STD.

Output 1 volt on standard records. Incorporates easily changeable 0.00025in sapphire stylus.

HGP39-1LP.

Output 1/3rd volt on microgroove records. Incorporates easily changeable 0.0001in sapphire stylus.

HGP38 CHARACTERISTICS

Output 1 volt on standard and ¼ volt on long playing records. Tracking weight 10 grammes maximum. Response characteristic smooth with no resonance. Cartridge works into load resistance of ½ megohm and crystal capacity of 1000 picafarads ensures adequate bass response.

STANDARD-LONG PLAYING

Price complete with HGP37 Cartridge

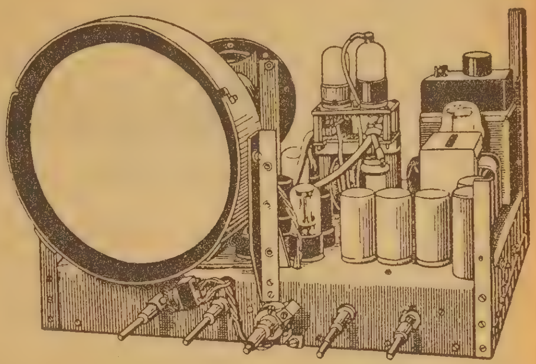
£5/15/-

. . . and NOW YOU CAN GET ACOS Hi-g HEADS FOR GP20

Australian Agents: **AMPLION (A'sia) PTY. LTD., SYDNEY, N.S.W.**

RUSSIA HAS TV IN THREE CENTRES—MORE TO COME

From the latest issue of Wireless World come these notes of television progress in Russia. They reveal that Russia now has four stations in operation, serving mainly communal receivers. Further stations are in course of construction.



A sketch of a recent prize-winning Russian television receiver as published in the Soviet journal Radio. The design of circuits and components broadly resembles early American practice, with the emphasis on small screens and simplified circuitry. Tubes resemble RMA "-GT" designs and actually use the same type numbers in some instances.

THE USSR is employing the "European" standard of 625 lines, 50 frames per second and f.m. sound, but using a band width of 8 mc. Transmissions are horizontally polarised.

It would appear that while there are a considerable number of communal receivers installed in the service areas of each of the four stations (Moscow (2), Leningrad and Kiev) there is a growing demand for domestic receivers.

The large majority of sets are for direct viewing, but some projection models are available and both forward and back projection is employed.

TV THEATRE

In addition to the two transmitting stations, Moscow now has a television theatre which regularly shows the transmitted programs on a big screen.

Each of the present stations originates its own programs, but can be linked with other transmitters by radio and cable.

Undoubtedly, one of the biggest and most important problems for the Soviet broadcasting authorities is the relaying of television programs in such a vast country. The shortest distance between any two of the present three centres is 500 miles.

The same applies to the new stations being constructed in Stalingrad and Sverdlovsk.

Russian television sets give a certain impression of the earlier American practice. The screens are fairly small—9in being about the average size—and are often made to look even smaller by the large loudspeaker grilles which appear alongside them on the fronts of the cabinets.

There are usualy four, five or six controls brought out for the viewer to adjust, and apart from the usual brightness, focus and sound volume these often include such things as contrast, frame-hold, wavechange and tone control.

MAINS TRANSFORMERS

Modern sets are still being built with mains transformers, and there is no evidence of the a.c./d.c. transformerless technique.

While most of the receivers are superhets, a good many straight sets are still being made for short-range reception. These usually have about ten valves to the superhets' 20.

Some models have provision for receiving a.m. and f.m. sound broadcasts as well as the f.m. television sound transmissions. Few, if any, extra valves are needed for this, as [illegible] of the sound-channel stages [illegible] for double purposes.

[illegible] recent prize-winning design, [illegible] example, has a valve which acts as a limiter on the f.m. signals and as a diode detector for the a.m. sound broadcasts.

Blocking oscillators are popular for both frame and line time-bases and scanning coils are often directly fed from the anodes of their appropriate output valves.

An unusual feature of one fairly typical receiver is the use of an efficiency diode to recover energy, not for the scanning system, but to energise the focus coil.

It seems there is no difficulty in getting enough scanning power for the deflector coils since the cathode ray tubes are fairly small with narrow deflection angles.

American-type metal valves with octal bases are widely used in receivers and the 6.3-V heater appears to be standard. Some of the valves have well-known American type numbers and equally familiar characteristics, while others have numbers which are not recognisable, but are obviously based on the same system. There are no signs of any miniature valves.

Components generally have much the same appearance as ours.

With horizontally polarised transmissions the receiving aerials are naturally T-shaped, as in America. A good many people, however, make use of indoor aerials, which are disguised to look something like electric bowl fires.

The bowl reflectors are actually used to give a directional effect, so that the aerials can be adjusted to find the best angle for reception.

COMMUNAL AERIALS

Naturally, the directivity is not very great because the reflectors are relatively small compared with the wavelength. In blocks of flats communal aerial systems are used, as the authorities have the same objections to forests of dipoles on the roofs as they have in this country.

Color television will be starting up soon, apparently on the frame-sequential system, and adaptors with rotating color filters are being made for use with existing black-and-white receivers.

One type of interference which is not experienced by town dwellers in the USSR is flutter caused by aircraft; flying is prohibited over built-up areas.

NEW MICROSCOPE CAN SEE ATOMS

THE atoms of matter have been made visible for the first time in history with a new form of electron miscroscope known as the field emission microscope.

The device was demonstrated in Cleveland at the National Metals Congress by its inventor, Dr. Erwin W. Muller, physics professor at Pennsylvania State College.

His microscope is of particular interest to metallurgists because it enables them for the first time to watch the behavior of individual atoms upon a metallic surface during such processes as heating, freezing, oxidation and corrosion.

The microscope is an instrument of astonishing simplicity. It consists of a glass tube resembling a TV tube, but very much smaller in size.

The flattened front of the tube is coated with phosphorescent material.

At the other end, pointing at the phosphorescent screen, is an electrode ending in an extremely fine needle.

It is an image of the tip of this needle which appears on the screen. Consequently the needle must be composed of the metal which is under study.

An electric field superimposed on the tube causes electrons to fly out of the atoms in the tip of the needle. Thees strike the screen and build up an image on it.

Each dot on the screen is the image of the atom from which the electrons emerged.

It is obvious that the microscope is limited to a very great extent. It does not possess the flexibility of an ordinary microscope, which permits you to put whatever object you please under it.

However, it makes up for its lack of flexibility by the enormous power which it has in its own realm.

Simon Gray
RADIO DIVISION

DISTRIBUTORS OF HIGH CLASS AUDIO EQUIPMENT FOR THE PROFESSIONAL BROADCASTING AND RECORDING ENGINEER, AND THE GENERAL TRADE

28 Elizabeth Street, Melbourne, C1 Telephone Cent. 2813

LEAK
Amplifiers for studio and domestic use (as used by the P.M.G. Department's Radio Section); **Pickups; Transformers; Cross-over Networks; etc.**

WHARFEDALE Speakers and Cross-over Networks
Wharfedale Wireless Works Ltd. are England's leading manufacturers of High Quality Loud Speakers.

GRAMPIAN BBC Type Recording Equipment.
Descriptive booklet giving full details including circuits, 7/6, incl. postage.

BAKER "Selhurst" Loudspeakers.
The best speakers of their class for natural reproduction.

We also specialise in a large number of other types of high-class Audio Equipment.

SOLE DISTRIBUTORS FOR AUSTRALIA

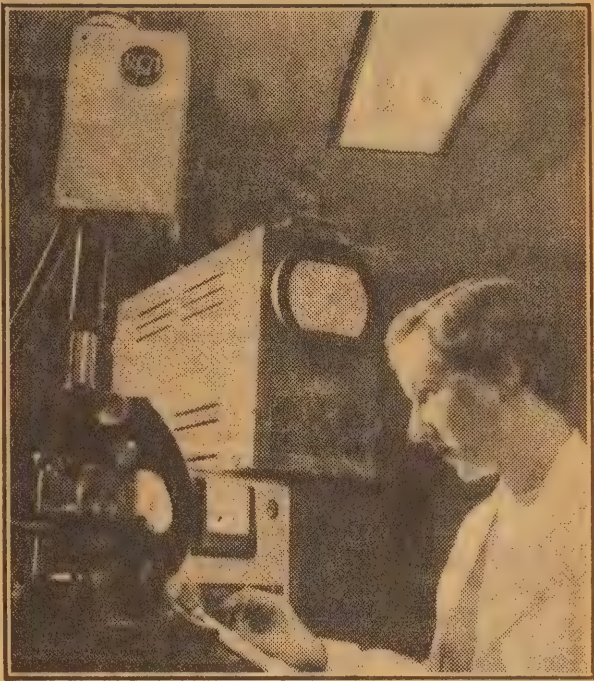
Simon Gray
RADIO DIVISION

28 ELIZABETH STREET MELBOURNE C1
PHONE CENT 2813

REPRESENTED BY AGENTS IN EVERY STATE

BLOOD COUNTING IS SPEEDED UP BY ELECTRONICS

The television camera has been turned into the eye of a simple and ingenious computer to count microscopic particles such as blood cells, bacterial cultures or grains of photographic emulsion.



The Sanguinometer undergoing tests at Sloan-Kettering Institute in New York. Television camera attached to microscope in foreground feeds information to computer, centre, and to monitor in background.

THE system, known in its laboratory stage as the Sanguinometer, was developed by a team of electronics engineers at the David Sarnoff Research Centre of RCA in Princeton, NJ, working in close cooperation with the Sloan-Kettering Institute, research unit of the Memorial Centre for Cancer and Allied Diseases, in New York.

The equipment was devised to provide a simple, rapid and accurate mass method of taking blood counts to detect the first signs of radiation sickness among persons in the target area of an atom-bomb.

A blood count is an important indicator in many diseases and in those circumstances where anaemia may be a complication, such as overexposure to radiation which may occur during atomic attacks.

In addition to this possible emergency use, its application is foreseen in hospitals and research centres to perform almost instantaneously and with a minimum of error, a process that has long been a laborious, time-consuming and often unprecise manual operation in laboratory work.

CLOSED CIRCUIT TV

The Sanguinometer is essentially a closed-circuit industrial television system combined with an optical microscope and a novel computer that has the ability to make a count of particles in a given field by means of a unique electronic circuit developed by L. E. Flory and W. S. Pike, of the technical staff, RCA Laboratories Division.

The television camera, substituting for the eye of the observer at the eyepiece of the microscope feeds the information which it "sees" to both the computer and a monitor viewing screen used in the developmental version to help in focus and illumination of the microscopic specimen.

The development of the Sanguinometer was carried out together with Dr. Leon Hellman, of the Sloan-Kettering Institute, who encouraged use of the television "eye" as the basis of a rapid counting system and worked closely with the RCA technical staff both in adapting the controls into a simple form suitable for clinical use and in conducting tests of the instrument on samples of human blood.

VIDEO PULSES

In operation, the camera tube of the Sanguinometer, scanning the specimen under the microscope, sends out video pulses as the scanning beam strikes the images of particles to be counted, and the pulses in turn actuate an electronic counter.

As in all television processes, the beam scans its field of vision from side to side, progressing downward in a series of parallel lines. The lines are so close together that in a normal microscopic magnification each particle to be counted interrupts several lines as the scanning beam moves across the field, and consequently produces several pulses in the output of the television system.

This means that large particles will interrupt more lines and produce more pulses individually than will small ones, and that the counter would be unable to distinguish between a large number of small particles or a small number of large ones unless compensation were made for their size.

COMPENSATION CIRCUIT

This obstacle was overcome with an ingenious diameter compensation circuit that is able to determine the average size of the particles by taking account of a direct relationship between the average time duration of the pulses and the diameter of the particles.

This indicates the number of video pulses created by each particle, a figure that is electronically fed to the counter where it divides the total number of pulses to give an automatic reading of the actual number of particles.

The entire process, as performed by the latest laboratory model of the Sanguinometer, is both simple and far more rapid than any manual count. Once the slide is prepared and put under the microscope, the operator manipulates a single control knob on the counting meter until an electric eye tube on the meter is closed.

This indicates that compensation has been made for the average diameter of the particles to be counted. It is then necessary for the operator only to read the meter to determine the number of particles in the field of the microscope.

The Sanguinometer has indicated in tests that it is capable of handling with only a small margin of error a count of many varieties of microscopic particles as long as the particles within any one specimen are nearly uniform in size. It is not suitable for counting particles whose sizes and shapes vary widely in a single specimen.

A DUMB ELECTRONIC BRAIN

AN electronic brain, with a low IQ, has been developed to do routine factory work too simple for those big-shot, genius computers who loll around taking up space and bragging about how smart they are.

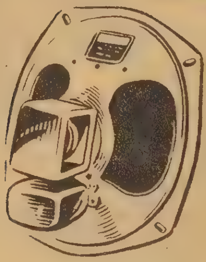
The machine, a relatively stupid gadget which has the mental range of a "high grade moron", is actually a "digital angular position encoder". G. M. Giannini, who developed it, calls it "Dopey".

He said that Dopey will be able to do the drudge-work in highly-mechanised industries. It can tell when a can hasn't been filled to the brim. It can determine when a batch of chemicals is too hot or too cold, when too much yeast or sugar has been dumped into a prepared cake mix. It can sound an alarm, stop a machine, write a teletype message to workers when a flaw is found in a piece of stuff on an assembly line.

"We created a machine with just enough intelligence for weighing and temperature control, just brignt enough to do the job," said Giannini. "We are sending a boy out to do a boy's job."

The famous Jensen
RANGE OF HIGH-FIDELITY
LOUD-SPEAKERS
at Magraths

6in P.M.



12in P.M. — TYPE AU54-12P38 — (Less Transformer).

Max. Power Handling Ability	20 Watt
Frequency Response	67 plus minus 12 CPS to 6.5 KC
Mounting Hole Centres	11-11/16in.
Voice Coil Impedance	12.5 ohms

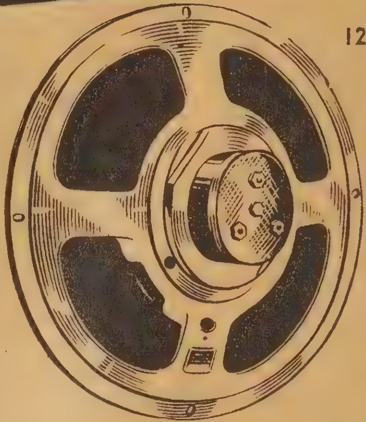
12in P.M. — TYPE AU61-12P40 — (Less Transformer).

Max. Power Handling Ability	15 Watt
Frequency Response	77 plus minus 12 CPS to 6.5 KC
Mounting Hole Centres	11-11/16in.
Voice Coil Impedance	6.5 ohms

12in P.M. — TYPE AU78-12P49 — (Less Transformer).

Max. Power Handling Ability	6 Watt
Frequency Response	65 plus minus 10 CPS to 6.5 KC
Mounting Hole Centres	11-11/16in.
Voice Coil Impedance	3 ohms

12in P.M.



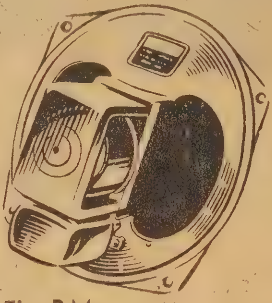
TRANSFORMERS

3.2 ohm VOICE COIL
— XJ1 6000 ohm
— XJ2 600 line

3 ohm VOICE COIL
— XA1 5000 ohm
— XA2 7000 ohm
— XA3 15000 ohm
— XA5 2000 ohm
— XA8 8000 ohm
— XA11 12000 CT
— XA12 10000 CT
— XA13 600 Line
— XA20 10000 ohm
— XA24 1200 Line

6.5 ohm VOICE COIL
— TU201 5000 ohm
— TU202 7000 ohm
— TU206 12000 ohm CT
— TU208 7000 ohm CT
— TU219 600 Line

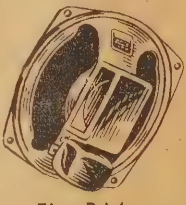
12.5 ohm VOICE COIL
— TX1 5000 ohm
— TX2 7000 ohm
— TX3 15000 ohm
— TX4 10000 ohm CT
— TX9 7000 ohm CT
— TX22 1200 Line
— TX24 600 Line



7in P.M.

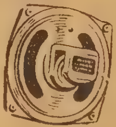
12in E.M. — TYPE AS34-2E30
(Less Transformer).
Max. Power Handling Ability
14 Watt
Frequency Response
77 plus minus 12 CPS to 6.5 KC
Mounting Hole Centres
11-11/16in.
Voice Coil Impedance
6.5 ohms
Field Coil Resistance
1500 ohms

4in P.M. — TYPE BH2-4P2
(Less Transformer).
Max. Power Handling Ability
3 Watt
Frequency Response
179 plus minus 17 CPS to 7.5 KC
Mounting Hole Centres
4-11/16in.
Voice Coil Impedance
3 ohms



5in P.M.

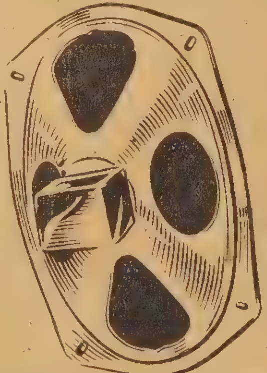
3" P.M. — TYPE BC1-3P1
(Less Transformer)
Max. Power Handling Ability
.5 Watt
Frequency Response
205 plus minus 35 CPS to 3.5 KC
Mounting Hole Centres
3-15/16"
Voice Coil Impedance
3.2 ohms



4in P.M.

7in P.M. — TYPE AY33-7P28
(Less Transformer).
Max. Power Handling Ability
6 Watt
Frequency Response
130 plus 12 CPS to 7.5 KC
Mounting Hole Centres 7½in.
Voice Coil Impedance
3 ohms

7in E.M. — TYPE AW28-7E12
(Less Transformer).
Max. Power Handling Ability
6 Watt
Frequency Response
130 plus 12 CPS to 7.5 KC
Mounting Hole Centres 7½in.
Voice Coil Impedance
3 ohms
Field Coil Resistance
1500 ohms



9in x 6in P.M.

9 x 6in P.M. — TYPE BF6-96P3 (Less Transformer).

Max. Power Handling Ability	5 Watt
Frequency Response	125 plus minus 15 CPS to 7.5 KC
Mounting Hole Centres	6-9/16in x 4-5/8in.
Voice Coil Impedance	3 ohms

6in P.M. — TYPE AG46-6P44 (Less Transformer).

Max. Power Handling Ability	4.5 Watt
Frequency Response	110 plus minus 10 CPS to 5 KC
Mounting Hole Centres	6-3/16in.
Voice Coil Impedance	3 ohms

6in E.M. — TYPE AE26-6E30 (Less Transformer).

Max. Power Handling Ability	3 Watt
Frequency Response	125 plus minus 15 CPS to 7 KC
Mounting Hole Centres	6-3/16in.
Voice Coil Impedance	3 ohms
Field Coil Resistance	1000 ohms

5in P.M. — TYPE AC44-5P32 (Less Transformer).

Max. Power Handling Ability	3 Watt
Frequency Response	110-160 CPS to 7.5 KC
Mounting Hole Centres	5½in.
Voice Coil Impedance	3 ohms

5in E.M. — TYPE AA20-5E12 (Less Transformer).

Max. Power Handling Ability	3 Watt
Frequency Response	110-160 CPS to 7.5 KC
Mounting Hole Centres 7½in.	5½in.
Voice Coil Impedance	3 ohms
Field Coil Resistance	1500 ohms

J. H. MAGRATH

AND CO. PTY. LTD.

208 LT. LONSDALE ST., MELB., C. 1, VIC. 'PHONE: FB3731

SPEEDY MAIL ORDER SERVICE

NEWS AND VIEWS OF THE MONTH

Double vision TV

THE Allen B. Dumont Laboratories, Inc., has unveiled its "duoscopic receiver" as a solution to the parlor problem of conflicting TV tastes.

The Duoscope projects two programs simultaneously on the TV screen, producing a blurred double image. By wearing special polaroid glasses, the viewer sees only one program. He can see the other by reversing the polaroid glasses.

Sounds from the separate programs are carried to the individual viewers by earphones—or earpieces as the manufacturer likes to call them. They are about the size of electronic hearing aid pieces.

The "split personality" TV set will cost about 2000 dollars.

The company hopes that mass production eventually will get the price of the sets down to around 600 dollars.

At a demonstration enthusiastic television men pointed out a number of interesting possibilities.

The new set would allow some members of the family to watch TV while others in the same room could read, play bridge or sit and talk without being disturbed.

Or a large group could watch and hear a favorite program and a lone wolf could tune in his choice.

★ ★ ★

Tests at Palomar

A PHOTOELECTRIC device which could measure the light from a single candle 15,000 miles from the earth has proved that the Palomar 200-inch telescope will penetrate farther into space than was originally predicted.

This satisfying finding and the discovery that the outer atmosphere of Jupiter consists mostly of hydrogen and helium were made in studies by Dr. William A. Baum of the Caltech staff.

In making the first definite calibration of the world's largest telescope mirror, he used a photon-counting photometer, an extremely sensitive light-measuring device.

POTENTIAL ABILITY

The photometer counts individual photons (the smallest packets of light) reflected from the mirror. It can count at a maximum rate of 6000 photons per second and could evaluate the light from a single Christmas candle at a distance of over 15,000 miles.

Dr. Baum's work has proved that the 200-inch Hale telescope has photographed stars and other objects which are at least 6,300,000 times dimmer than the dimmest stars visible to the naked eye.

More technically, this means that the telescope has photographed stars and clouds of stars down to a limiting magnitude of plus 23. This limit is one-half magnitude fainter than the previously estimated magnitude of 22.5.

Magnitude refers to the apparent brightness of a star or other heavenly object. Apparently very bright objects have low magnitudes, numerically speaking, and apparently faint objects high.

For example, the apparent magnitude of the brilliant sun is minus 26.7; the full moon as seen from the earth is minus 12.5, and the dimmest stars visible to the unaided eye are magnitude plus 6.

JUPITER FINDINGS

The Jupiter studies were made by Dr. Baum with the help of Dr. A. D. Code of the Washburn Observatory, Madison, Wis. They obtained the first direct observation evidence that hydrogen (of molecular weight 2) and helium (4) predominate in Jupiter's atmosphere.

The observations were made when Jupiter eclipsed a bright star, Sigma Arietis. With a photomultiplier attached to a grating spectograph, the scientists observed how long it took light from the star to dim and disappear as Jupiter's atmosphere was interposed between the star and earth.

Additional estimates were obtained that helium is about three times as abundant as hydrogen on the planets Uranus and Neptune.

★ ★ ★

Electronic brain makes cars

ON the outskirts of Cleveland in an up-to-the-minute plant of the Ford Motor Co., auto engine blocks are machined without the touch of a human hand. An electronic brain,

POPULAR SCIENCE QUIZ

Q. Why has the famous iron pillar at Delhi, India, remained virtually free of rust over hundreds of years? Did its builders possess a secret unknown to us?

A. According to J. C. Hudson, of the British Iron and Steel Research Association, it is the climate and not the kind of iron that has kept the famous iron pillar of Delhi, India, virtually unrusted since its erection some 1500 years ago in the fifth century, AD.

To support the claim that it is the mildness of the climate rather than any intrinsic superiority of the iron that has protected the pillar against serious rusting, he states that both steel and zinc specimens exposed near the 23-foot, 6-ton pillar showed very little corrosion in a year.

It appears that very little rusting occurs unless the humidity exceeds 70 pc and this critical value is reached in Delhi for only a very short period during a year. Sulphur pollution, which controls corrosion rate when humidity is high, is also very low near the pillar.

★ ★ ★

Q. How small can a gyroscope be to help guide a missile?

A. A miniature gyroscope about the size of a torch cell is about to go into mass production to help steer guided missiles.

A joint production of the United States Times Corp., Waterbury, Conn., and Sanders Associates, Inc., of Nashua, NH, the new gyro is less than an inch in diameter, under two inches long and weighs less than three ounces. Its precision rotor comes up to a running speed of 24,000 revolutions a minute in less than 10 seconds.

In addition to helping guided missiles stay on course, the gyros will go into aircraft instruments and fire-control systems. They also will help stabilise radar antennas.

String-walking gyroscopes regularly appear as children's toys. With their rotors spinning rapidly, the devices can hang as if by magic from the lip of a glass. One end of the toy is suspended in space, while the other end is supported only by the lip of the glass.

Once their rotors are whirling, gyroscopes have the property of resisting a change in the way they are oriented in space. Thus if the rotor is brought up to speed while lying in a horizontal plane, it resists being shifted into a vertical plane. This quality makes gyroscopes particularly good for controlling functions of air-borne equipment, regardless of the pitching and rolling of the plane.

★ ★ ★

Q. How do chemicals speed the drying of paints and inks?

A. According to recent reports from Lehigh University and the National Printing Ink Research Institute, both US bodies, a new method of making paints, varnishes and inks dry faster is to put into their linseed oil inexpensive amine chemicals together with manganese, iron and other metals that have proved to speed the drying process.

The new procedure demands that cobalt metal or compounds, which have been used to accelerate or catalyse drying reactions, be excluded from the oil to allow the amines, the manganese and the iron to work to the best advantage.

Drying of oil paint and ink is an oxidation process speeded by complex iron compounds in much the same way as iron containing haemoglobin acts in the blood.

TELEPHONES: JA2877, JA2878, JA5881 **FERGUSON LANE, CHATSWOOD**

STANDARD -FERGUSON- RANGE

RECEIVER POWER TRANSFORMERS

CODE NO	PRIMARY VOLTS	HTV aside	HT mA	FILAMENTS
PF185	240	150	30	6.3V/2A
PF299	240	285	40	6.3V/2A, 5V/2A
PF300	240	325	40	6.3V/2A, 5V/2A
PF201	240	225	50	6.3V/2A

NOTE: All transformers are available with upright mounting. The following 9 transformers are also available with flat mtg., fitted with an adaptor plate to suit 3 x 3½in centres. On removal of plate, mtg. centres become 2½ x 3 1-8in. IF flat mtg. is required afix Code No by letter F e.g. PF151F.

CODE NO	PRIMARY VOLTS	HTV aside	HT mA	FILAMENTS
PF151	230, 240	285	60	6.3V/2A, 5V/2A
PF166	230, 240	325	60	6.3V/2A, 5V/2A
PF165	230, 240	385	60	6.3V/2A, 5V/2A
PF170	230, 240	285	80	6.3V/2A, 6.3V/2A, 5V/2A
PF169	230, 240	325	80	6.3V/2A, 6.3V/2A, 5V/2A
PF168	230, 240	385	80	6.3V/2A, 6.3V/2A, 5V/2A
PF130	230, 240	285	100	6.3VCT/2A, 6.3V/2A, 5V/2A
PF164	230, 240	325	100	6.3VCT/2A, 6.3V/2A, 5V/2A
PF160	230, 240	385	100	6.3VCT/2.5A, 6.3V/2A, 5V/2A
PF152	230, 240	285	125	6.3VCT/3A, 6.3V/2A, 5V/2A
PF163	230, 240	325	125	6.3VCT/2.5A, 6.3V/2A, 5V/2A
PF181	230, 240	385	125	6.3VCT/3A, 6.3V/3A, 5V/2A
PF174	230, 240	285	150	6.3VCT/2A, 6.3V/2A, 5V/2A
PF142	230, 240	325	150	6.3VCT/2A, 6.3V/2A, 5V/3A
PF175	230, 240	385	150	6.3VCT/2A, 6.3V/2A, 5V/3A
PF167	230, 240	385	150	6.3VCT/2A, 5V/3A, 2.5VCT/5A
PF173	230, 240	425	175	6.3VCT/3A, 6.3V/2A, 5V/3A
PF140	230, 240	385	200	6.3VCT/3A, 6.3V/3A, 5V/3A
PF171	230, 240	385	250	6.3VCT/4A, 6.3V/3A, 5V/3A

POWER AMP. AND LOW POWER T'MITTER UNITS

PF172	230, 240	500	200	6.3V/4A, 6.3V/3A, 5V/3A
PF143	230, 240	600 500	200	2.5V/5A, 2.5V/5A, 5.5V/.5A
PF147	200, 230 240, 260	1000 750 500	200 250 300	5.5V/.3A
PF179	230, 240	475	225	6.3VCT/4A, 6.3V/2A, 5V/3A
PF107	230, 240	585	250	6.3V/3A, 6.3V/2.5A, 5V/3A

C.R.O. TRANSFORMERS

PF188	240	350 one ext. 900	30 2	6.3V/2A, 6.3V/1A 5V tap 4V/2A 4V tap 2.5V/2A
PF545	240	350 one ext. 1000	20 1	6.3V/3A, 6.3V/.6A, 4V tap 2.5/2A

TAPE-RECORDING TRANSFORMERS

PF642	230, 240	250	80	6.3V/3A, 5V/2A Low radiation
PF664	240	265	80	6.3V/3A, 5V/2A Low radiation

PHOTOFLASH TRANSFORMERS

HT119	200	4000 ½ wave		
HT131	240	1100 ½ wave		prim. also vib, 5.2 or 4V

POWER CHOKES

CODE NO.	IND HY.	DC RES.	DC MA
CF100	50	1900	10
CF101	30	870	25
CF102	15	300	60
CF103	30	420	60
CF104	30	580	80
CF105	15	250	80
CF106	12	200	100
CF107	30	360	100
CF108	12	135	150
CF109	20	225	150
CF110	12	100	200
CF111	16	165	200

CODE NO.	IND HY.	RES DC	DC MA
CF112	10	70	250
CF113	5/20	70	50/250
CF115	.017	.6	2A
CF119	.005	.1	6A
CF162	10	90	330
CF196	20	130	125
CF114*	40 watt fluor. ballest		
CF213*	20 watt fluor. ballast		

* Fitted with rubber mounting to reduce hum. Standard 5¼in hole centres.

VIBRATOR AND A.C. POWER TRANSFORMERS

CODE NO	PRIMARY VOLTS	HTV aside	HT mA	FILAMENTS
PF182	240AC 12VIB	200	40	12.6/1A
PF122	240AC 6VIB	220	40	6.3V/2A
PF125	240AC 6VIB	250	60	6.3V/2A
PF126	240AC 12VIB	250	60	12.6VCT/1A
PF119	240AC 6VIB	325	125	6.3V/4A
PF146	200, 230, 240 AC 12VIB	325	150	12.6VCT/2.5A

VIBRATOR TRANSFORMERS

CODE NO	PRIM VOLTS	DC Volts	O'put mA	Buffer Full Sec	
VT101	6	90	15	.008	
VT102	6	150	25	.005	
VT103	6	200	50	.005	
VT127	6	200	50	.005	Low radiation. Car Radios
VT104	6	250	60	.005	
VT107	6	250	60	.005	Low radiation. Car Radios
VT106	6	300	75	.008	
VT122	6	400	50	.005	
VT146	12 or 6	240AC	50w	1MFD	For Emergency light, etc.
VT112	12	200	50	.005	
VT132	12	200	60	.005	Low radiation. Car Radios
VT105	12	250	60	.005	
VT117	12	250	60	.005	Low radiation. Car Radios
VT114	12	300	75	.008	
VT123	12	320	125	.005	
VT113	24	200	50	.005	
VT116	24	250	60	.005	
VT115	24	300	75	.008	
VT119	32	150	25	.005	
VT100	32	200	40	.005	
VT124	32	250	60	.005	

FILAMENT TRANSFORMERS

CODE NO	PRIMARY VOLTS	SEC. VOLTS
PF118	220, 240, 260	2.5V/5A, 2.5V/5A
PF158	220, 240, 260	5V/8A
PF476	240	6.3V/3A
PF138	220, 240	6.3V/4A, 5V/4A, 2.5V/4A, 2.5V/4A
PF162	240	6.3V/3A, 6.3V/3A
PF154	200, 230, 240	7V tap 6V/7A, 6.3V/3A, 5VCT/5A 5V/3A, 2.5V/7A
PF102	240	7.5V/2A
PF111	240	10V/5A
PF211	200, 230, 240	10VCT/10A
PF131	230, 240	10VCT/10A, 5V/15A
PF123	240	15, 12, 8, 6V/1.8A
PF439	240	32V 60W Enclosed one outlet
PF457	240	32V 125W Enclosed two outlets
PF491	240	32V 200 W Enclosed two outlets

BATTERY-CHARGING TRANSFORMERS

CODE NO	PRIMARY VOLTS	SEC. VOLTS
PF265	230, 240	17V tap 11.5, 10, 8.5/4.2A
PF389	230, 240	17, 11.5, 10, 8.5V/4.2A, 17, 11.5V/4.2A 17, 11.5V/4.2A
PF537	240	17V tap 11.5V/0.4A

BELL TRANSFORMERS

CODE NO	PRIMARY VOLTS	SEC. VOLTS
PF648	240	10W Continuous or 2A intermittent.

Fully enclosed including 240V socket and outlet terminals. Designed to operate local and imported chimes as well as various types of bells

IN ADDITION TO THE ABOVE RANGE, A STANDARD RANGE OF OUTPUT AND MODULATION TRANSFORMERS IS AVAILABLE

ENGINEERED **TODAY** FOR **TOMORROW'S** REQUIREMENTS containing 27 miles of wire, helps mastermind operations.

Signal lights on control boards flash warnings when a tool is wearing out and needs replacement. Red, green and yellow pushbuttons control myriad manufacturing steps.

This and a companion foundry are among the latest and most advanced examples of the widespread movement toward doing more and more production work by machine, less and less by hand.

In the engine plant, it takes only three machines and nine men to drill the necessary oil holes in a crankshaft. With conventional machining methods, 29 machines and 39 men were needed to do the same job.

★ ★ ★

Radio checkup

AMERICA has a device which tells whether international short-wave radio broadcasts, or any other long-range transmitters, are successfully reaching their destinations with their messages.

Short-wave radio signals bounce up and down around the world between the earth's surface and layers in the atmosphere which are of varying height. Thus, at great distance, it may be difficult to tell just where the signal has rebounded back to earth.

Now, "Cozi" (communications zone indicator) sends out a radar beam along the same path as the radio wave—and "Cozi" come back and tells where it's travelled.

It is possible to know instantly and accurately whether a given frequency is being reflected at the proper skip distance to reach its destination. If not, the frequency may be changed.

"Cozi" also may be able to tell whether a frequency is being "jammed" by deliberate enemy action.

★ ★ ★

New sailplanes

Three British sailplanes will be flown by the British team in the world gliding championships which are to be held in Derbyshire, England, this summer. Two are new designs. The third is the type which won the world championships held in Spain in 1953.

One of the new sailplanes has been designed by Hugh Kendal, and is to make its first flight shortly, piloted by the designer. It is a single-seater. The fuselage was built by Miles Aircraft, and the wings by Elliott's of Newbury.

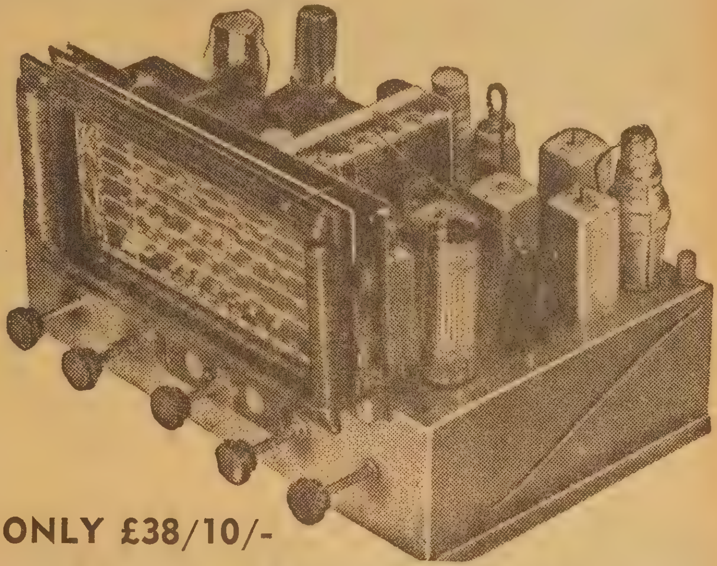
The new Slingsby sailplane which it is hoped will be ready in time for the championships is the T-34, a two-seat trainer. It is not designed primarily for competitions, but for training in crosscountry and cloud flying.

The T-34 has slightly swept-forward wings, but the sweep is hardly noticeable. The forward part of the fuselage is made of laminated plastic.

Plastic is also used for certain parts of the skin of the Slingsby Sky, the third sailplane to be flown by the British team, and the design which won the world championships last year. Several competitors from other countries will also be flying Sky sailplanes.

THE LATEST GEX MODEL CRYSTAL SET with Germanium permanent fixed crystal detector. In leatherette covered case, size 6in x 4in x 2½in, £4/6/9. Complete with headphones, £6/5/-. Midget Crystal Set 67/6, Phones 38/4.

1 valve mantel model radio in leatherette covered case 6½in x 4½in x 5⅜in with headphones and batteries, £7/16/-. Also available in a leatherette covered portable case 9in x 5in x 6in, £8/10/-.
2 valve mantel model radio in leatherette covered case 8in x 5in x 2¾in with 3½in speaker and batteries, £9/17/6, or in a leatherette covered portable case 9in x 5in x 6in, £10/10/-.
Ideal sets for use in hospitals or as a second set for household use. Battery life approximately 6-9 months. Replacement batteries 22/3 per set. Country clients please allow for freight.



ONLY £38/10/-

FOR THIS 8-VALVE DUAL WAVE RADIO

Here's value only to be found at Radio House Pty. Ltd. This readymade and tested chassis is complete with valves and 12in permagnetic speaker. Complete in every detail, it's easily fitted into your radio or radiogram cabinet and can be supplied with a polished wood front panel. Ideal for overseas reception, fitted with phono pick-up terminals, and has two separate tone controls for treble and bass boost. Size 16in x 10½in x 9in high.

SOUND AMPLIFIERS

For Phonograph Pick-up and Microphone

240 volt A.C. models complete ready for use (without cabinet, microphone or pickup)

3 valve with 8in speaker, £12/17/6 (suitable for phono pick-up only, 4 watt output). 12in speaker £1 extra.

4 valve midget with 8in speaker, £13/15/- (suitable for phono pick-up and microphone, 4 watt output). 12in speaker £1 extra.

5 valve with 12in speaker, £21/10/- (suitable for phono pick-up only, 8 watt output).

6 valve with 12in speaker, £25/-/- (suitable for phono pick-up and microphone 12 watt output).

SPECIAL MODELS MADE TO ORDER

6 volt battery-operated 3 valve and vibrator with 8in speaker, £18/10/- suitable for phono pick-up and microphone 4 watt).

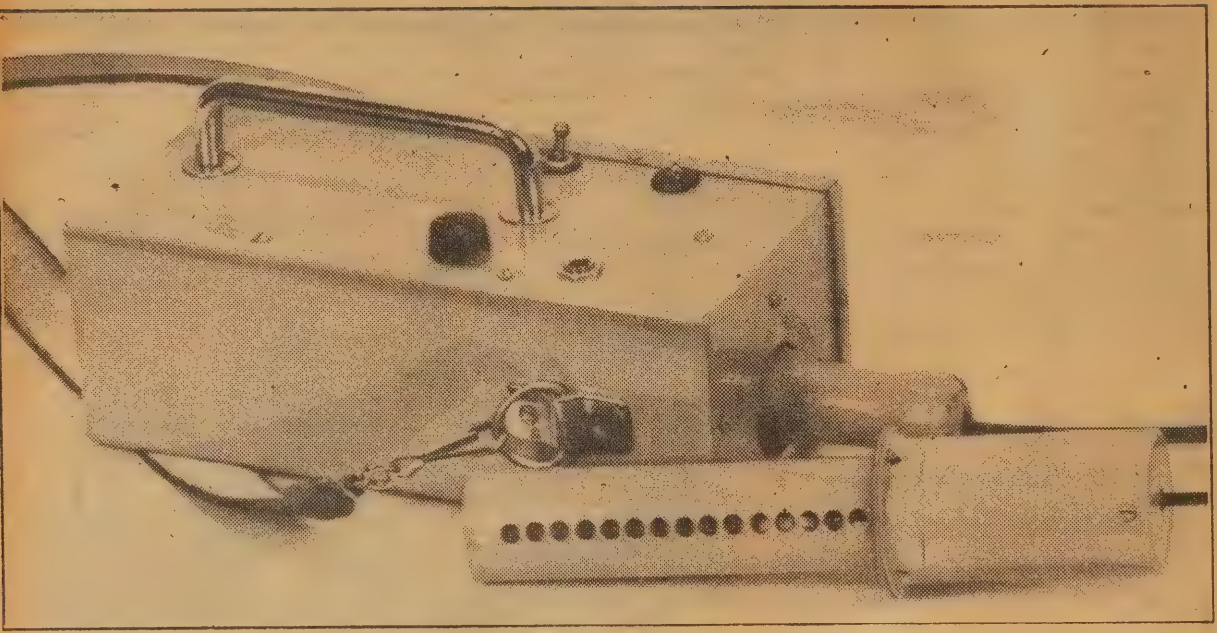
SPECIAL CUT-PRICE LINES AT GIVE-AWAY PRICES

A.W.A. Vibrator power supply 4v. to 90v. at 20 m/a. New and complete, 37/6.
Dropping resistor for 6v. battery, 9/-; for 12v., 14/- extra.
Resin cored solder, 1lb reel, 10/6.
Chassis 3⅝in x 3⅛in x 1⅞in, 1/6. Panel to suit, 6d.
Collaro phono motor and pick-up, 240v. A.C., £5/5/-. Reduced from £9/17/6.
Combination Tool, 10in hammer, pincers, staple puller, 2 wire cutters, wire grips. Forged steel. German manufacture, 22/6. Reduced to 15/-.
Electron Aerial Wire—two 50ft coils, 4/-. Chrome swivel head torch, 26/6 complete.
Swiss-made 240 volt A.C. record changers for 8 records—crystal pickup, £12/7/6.
"Scope" electro-plating set. Plates nickel, copper, tin and zinc, 49/6. Gold, 15/9, or silver, 8/6 extra.
Wizard clip-on Lamp Holder Bracket with ball and socket swivel. All metal. Suitable for workshop or bed lamp, 7/6.
Shop-soiled Stromberg Carlson 3-speed Record Changers, £18/17/6. As new.
English TELSEN 3ft 2-note Door Chimes, £3/9/6. Small Model, 42/6.
Pruning shears, 9in Polished Steel Imported, 17/6. Reduced to 10/-.
Goldring Gramophone Soundbox Speakers, 15/6. Reduced to 5/-.
Spring Phonograph Motor with Turntable, 47/6.

All the above can be had by Mail Order, Freight Charges to be added.

RADIO HOUSE PTY. LTD.

296 PITT STREET, SYDNEY



This view shows how the Geiger tube cover is fitted on to a socket housing to carry the Geiger tube as an external probe. The metal caste of the Geiger tube should be insulated from the shield cover either by loosely wrapping it in a few layers of thin plastic sheet or by using plastic spaghetti tubing as circular spacers at two or more points.

MORE ON THE GEIGER COUNTER

Following on our description of a portable Geiger counter in last month's issue, we outline here the construction of a probe housing for the Geiger tube and methods of testing the completed unit. In addition, we discuss the occurrence of uranium-bearing minerals and give hints on prospecting for them.

by Raymond Howe

THE reader response to the preceding articles on uranium prospecting has been quite marked. In fact, the introductory article in the March issue produced such a demand for Geiger tubes that they are temporarily in short supply.

Consequently, with the description in the April issue of a Geiger counter designed around locally available components, many readers found their orders for the particular Geiger tube unfilled. We understand, however, that the situation will improve before this issue appears on the stands.

GEIGER TUBE TYPE

While on the question of Geiger tubes, the particular type used in the unit is mainly suitable for counting gamma rays, though it may respond to high energy beta rays. The essential difference between it and the beta-counting type is the thickness and mass of the cathode wall material. Usually, a small, thin "window" is provided in a beta tube, either at the end or along one side.

In view of the relatively high atomic weight of brass and the possibiltiy of counting high energy beta particles, we drilled a series of ¼in holes, for what it's worth, along the underside of the brass tube shield specified last month.

There are occasions when the ability to count beta rays is an advantage. For instance, the ratio between beta and gamma count can, sometimes, be interpreted to distinguish between uranium-bearing and thorium-bearing minerals.

It is interesting to note, therefore, that one valve company lists in their range of Geiger tubes a beta-gamma counter which has a similar voltage requirement to the type used in the unit. It is shorter, has a different socket arrangement but of course costs more.

Since the last issue, we have had opportunity to make a closer check on the optimum value of inductance in the 3V4 EHT supply. For the particular frequency of the relaxation oscillator circuit, we found that about 8 henries was the optimum inductance value, with a range of values from about 6 henries to about 10 henries being near enough to give good results.

MINIMUM DRAIN

While the value of inductance is not necessarily critical insofar as obtaining the required operating voltage, the use of the optimum value does ensure that the B battery drain is always at a minimum. On the other hand, a higher operating voltage, as demanded by some Geiger tubes, would place more stringent tolerance on the value of inductance.

Incidentally, the inductor has a moulded core, which appears to be much more efficient for the purpose than a laminated one.

In checking the completed Geiger

counter, correct functioning of the EHT supply is normally indicated when the irregular background count can be heard clearly in the phones. The optimum value of inductance will allow this condition to be obtained at a total B battery drain of less than 1.5 mA.

If, for some reason, the background count is not heard, we suggest that you make the following simple checks. Firstly, trace through the wiring to make sure that there are no mistakes and that the batteries are connected in the correct polarity.

See that the neon in the grid circuit of the 3V4 is glowing. Touch a wire to the metal case and flick the other end across the cathode pin of the Geiger tube. If this produces a click in the headphones, it means that the 1S5 circuit is satisfactory and that there is some EHT applied to the Geiger tube.

HIGH IMPEDANCE

Unfortunately, the high internal impedance of EHT supplies of this nature places restriction on the type of voltmeter which can be successfully used to check it. The point is that any current drawn by the meter will cause the output voltage to read low.

In our tests, we used a meter of 20,000 ohms per volt and set to read on the 5000 volt range. This represented a shunt resistance across the supply of 100 megohms which, for every 100 volts, would draw 1 microampere. Even this light loading is slightly more than that presented by the Geiger tube when producing the background count.

It is easy to see why even the 1 megohm loading represented by a standard multimeter of 1000 ohms-per-volt set to read on the 1000 volt range will lead to a completely inaccurate reading.

However, to illustrate the point and also to act as a guide, we found that a standard multimeter set on the 1000 volt range showed a reading of about 50 volts when the Geiger tube was supplied with optimum voltage.

SIMPLE MODIFICATION

Recent investigations into the possibility of fitting a simple count-rate meter circuit leads us to suggest a simple modification to the original circuit for those who wish to reduce still further the already low current drain. Unfortunately, it is at the expense of satisfactory operation of the neon flasher in the anode circuit of the 1S5.

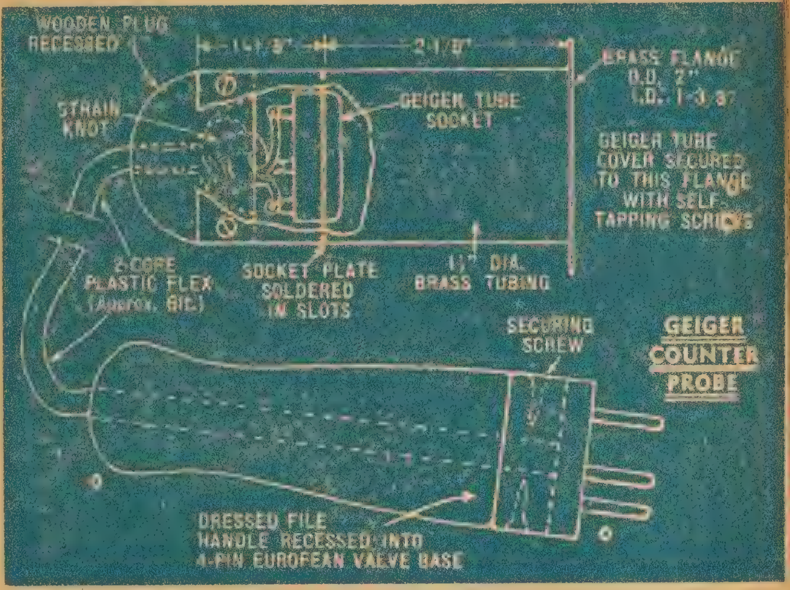
The suggestion is to remove the 10 megohm resistor and the .01 mfd capacitor connected from the 1S5 grid to chassis. The increased time constant allows the 1S5 grid to be "cut off" more effectively and removes any break-through of the relaxation oscillator tone when the control is correctly adjusted.

Further, the reduction of shunting on the Geiger tube permits a higher amplitude of pulse to be obtained for a given operating voltage.

The overall result of this small change, together with the use of the optimum inductance value in the 3V4 circuit, is to allow the Geiger counter to operate quite satisfactorily on a B battery current drain of less than 0.75 mA.

On the other hand, the phone plug has to be removed for the neon flasher to operate and the intensity of these flashes is considerably reduced. For those who do not attach much importance to the neon flasher, these drawbacks are of little consequence.

DETAILS OF PROBE HOUSING


WOODEN PLUG RECESSED 1"
1-1/8"
2-1/8"
BRASS FLANGE O.D. 2" I.D. 1-3/8"
STRAIN KNOT
GEIGER TUBE SOCKET
GEIGER TUBE COVER SECURED TO THIS FLANGE WITH SELF-TAPPING SCREWS
2-CORE PLASTIC FLEX (Approx. 6ft.)
SOCKET PLATE SOLDERED IN SLOTS
1¾" DIA. BRASS TUBING
SECURING SCREW
GEIGER COUNTER PROBE
DRESSED FILE HANDLE RECESSED INTO 4-PIN EUROPEAN VALVE BASE

The information given here should enable you to build the probe housing without any difficulty. The 4-6in European valve, from which the base is required, can usually be picked up at most stores handling disposals radio equipment.

A count-rate meter can be a handy addition to the instrument but as it was not intended to carry it in the original design, there is a limit to the circuit complexity which can be introduced.

Without discussing the point at length, we suggest that, if required, it take the form of a 50 microampere meter wired in series with the high tension feed to the two resistors in the anode circuit of the 1S5 and shunted with a 400 mfd 12 peak volt electrolytic capacitor.

It is necessary that the headphones be plugged in for the meter to indicate. Alternatively, a "ormally-closed phone jack could be used.

In the circumstances, only one scale is available. It need not be calibrated in counts per minute as it will indicate the number of times the count is greater than the background count.

INSTALLATION

It is envisaged that the strap clip on the right hand cover be moved down a few inches and a small meter mounted in the cover. The phone jack and the neon flasher can be interchanged to give space for the meter case. If necessary, a switch can be installed to short-circuit the meter when not required.

Alternatively, a closed-circuit jack can be mounted and the meter plugged in as an external unit when required. The 400 mfd capacitor could be mounted permanently in the instrument case.

The probe housing described here can prove quite convenient for general searching. In practice, the Geiger tube cover is taken from the case, the Geiger tube removed and the probe adaptor plugged in. The Geiger tube is plugged into the probe socket and the cover slipped over the Geiger tube and secured with its own self-tapping screws to the flange on the probe socket portion.

The probe adaptor is made up by recessing a file handle of suitable size into a base removed from a European 4-pin valve. A ¼in hole is drilled down the centre to take the plastic flex to the pins.

PROBE SOCKET

The probe socket portion consists of 3¼in of brass tubing sweated to a flange of the dimensions given in the drawing. The diameter of the brass tubing can be anything from 1½in to 2in. We used 1¾in tubing, but it involved cutting four small nicks at the flange end to avoid fouling of the self tapping screws.

The 4-pin European-type socket is slipped into place through the tube end and its mounting plate sweated into two slots cut in the tubing with a hacksaw.

A wooden end plug seals the tubing and prevents any strain on the flex from being taken by the connections at the socket.

The length of flex is not important but it is obvious that the probe is not designed for indiscriminate lowering down blind holes or crevices. Note that plastic flex is suggested because of its high insulation resistance and non-hygroscopic nature.

So much then for the counter itself. We intend now to discuss the occurrence of uranium and significant features of known deposits.

The metal uranium does not occur in nature but is found in com-

COLLINS RADIO

Mail Order Service Fastest and Most Reliable in the Commonwealth

409 LONSDALE STREET, MELBOURNE, C.4., MU1033

ood sent by ordinary parcel post, except when over 11lb, which are sent by rail, freight payable your end. Postage rates shown gains. goods advertised. For registered post send 1/- extra. Goods required air-freight sent F.O.N. unless air-freight charges emitted with order. To save delay send exact amount (M.O., Postal Notes, Stamps, Cash, Cheque [add exchange]). If in doubt bout prices and postage on goods not advertised, send ample money. Change refunded with parcel. Order by part number and rief description of goods. Refer to page and date of advertisement in Radio and Hobbies if possible.

FAST QUOTE SERVICE

For quickest possible service, write on the left-hand side of a sheet of paper the radio parts that interest you—one beneath the other. If a kit, itemise. Add your name and address and send it to us with a stamped, self-addressed envelope. We will add the latest prices and return to you. Use this sheet as your order form and return to us with remittance for cost and postage as quoted. Goods will be sent same day. Any surplus refunded. Sorry, no C.O.D.

URANIUM 235 We can quote for parts for Geiger Counter described April R & H. Use our fast quote service.

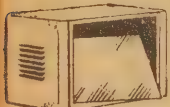
GERMANIUM DIODES 10/-

POST FREE

The best crystal detector. Type 4A42.

CHINESE-JAPANESE-ENGLISH DICTIONARY. 5000 characters, used by RAF. 506 pages. Part No. 4E2. **3/6** Post Free.

INSTRUMENT and AMPLIFIER CASES



Receiver type, vented, takes 8in x 5in chassis, with removable front panel as illustrated. Inside height, 6in. Steel, black krinkle finish. Front rounded corners.
Part No. 4C12, 31/6. Post Free.
For any other type or size, use our FAST QUOTE SERVICE

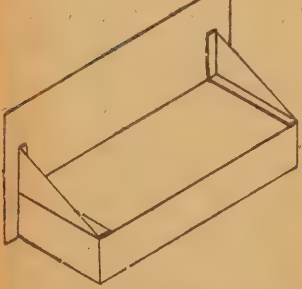
SQUARE STEEL CASE CASES Square Corners, No Louvres.

9in x 7in x 5½in deep.	Part No. 4D2	20/6
7in x 5in x 4½in deep.	Part No. 4D3	18/6
5in x 5in x 4in deep.	Part No. 4D4	17/6

Post Free.

COLRAD CHASSIS-PAK

POST FREE



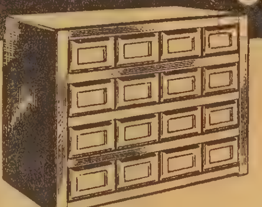
All aluminium. Chassis only, panels only, chassis and panels, or chassis Pak complete with chassis, panel and brackets will be sent Post Free same day as order at prices marked below. Brackets are not supplied separately.

Chassis Only Post Free	Price	Panels Only Post Free	Price	Bracket Size	Chasis-Pak Post free
6" x 4" x 2"	7/6	7" x 5"	2/3	3" x 3"	12/-
8" x 5" x 2½"	10/-	9" x 7"	3/9	4" x 4"	16/-
10" x 6" x 2½"	12/-	11" x 9"	6/3	5" x 5"	21/-
11" x 8" x 2½"	14/-	13" x 9"	7/3	5" x 5"	24/-
13" x 7" x 2½"	14/-	15" x 9"	8/6	5" x 5"	25/-
13" x 10" x 2½"	17/6	15" x 9"	8/6	5" x 5"	28/6
17" x 8" x 3"	22/6	19" x 12"	13/9	7" x 7"	40/-
17" x 10" x 3"	24/6	19" x 12"	13/9	7" x 7"	42/-
17" x 12" x 3"	26/6	19" x 12"	13/9	7" x 7"	44/-

All unblemished Bright Aluminium

Order Colrad Chassis-pak by chassis size only

STOP! FIND THOSE LITTLE THINGS FAST!

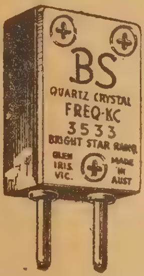


16 DRAWERS
1½in x 2 5/8in x 5½in
OR 4 Long Drawers
1½in x 10½in x 5½in
In THIS ALL-STEEL
COLRAD
HANDY CABINET

A craftsman-built unit, attractively painted in baked grey hammertone enamel with provision for fitting identification card on each drawer.

A strong and most useful cabinet for holding small parts or tools. Ideal for mechanic, engineer, garage or home workshop. Provision is made for stacking into units.
OVERALL SIZE 11¾in. WIDE, 9in. HIGH, 5¼in. DEEP. **48/-**
Postage: Vic.; 3/8; NSW., ACT., SA, Tas., 6/-; Qld., WA, NT, 8/4.

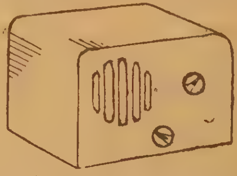
COLRAD



'BRIGHT STAR' QUARTZ CRYSTALS

'Ham' Bands	
3.5 MC	£2/16/8
7 MC	£2/16/8
14 MC	£5/5/-

'Ham' Regrinds £1/-/-
Commercial Bands (bushfire, ships, ambulance, walkie talkie, &c.) £4/10/-
Regrinds £1/10/-
Large RAAF DCH-C Holders (pins ⅜in centres 1/8in dia. Extra 10/-. All crystals ground and chemically etched for permanent stability. Tolerance — PMG Spec. 0.02 pc from 0 deg to 60 deg C. Finer Freq. Tolerance extra. 1000 Kc crystals £6/5/-.



Miniature Metal Mantel Cabinets with chassis and flush Q-Plus knobs to suit. 8in x 6in x 5in deep. Takes 3in speaker. In pastel shades of red, blue, cream, green. We will supply your preferred color if we have it, otherwise what is left in stock.

SUITABLE
- **RECEIVERS**
- **TALK-BACKS**
- **SPEAKERS**

10/-

Postage: Vic., 3/-; Int., 4/6.

COLRAD

ELECTRONIC MORSE CODE OUTFIT

For visual and audible signals. High, clear note like commercial radio transmitters. Ready to operate with battery, high grade morse key, neon signal lamp on baseboard.
PRICE **£2/9/6**
Plus Postage 3/-. Headphones 25/- extra. (High or low impedance OK).

HIGH GRADE METERS

Brand new, high-grade, 2¼in square jewelled movement meters. Calibrated 0-20 volt on 5 mA movement, with internal multiplier. In Original packaging. Part No. 4D44. Post Free.
Can be converted other ranges — volts, amps, mA. Available a few 0-40v, 4EI. **19/6**

TAKES 8in or SMALLER SPEAKER.
8in metal, round, suitable car radio or home extension speaker. Choice of Green, Cream, Pastel finish. Post Free. Part No. 4D45. .. **22/6**

bination with other elements in a number of minerals. When these minerals are found in sufficient concentrations, they constitute the ores of uranium.

While quite a large number of uranium-bearing minerals are known, many are of little value as a commercial source of uranium, due either to too low a content of the metal or to combination with other metals in such a form as to render its extraction very difficult.

PRIMARY MINERALS

Uranium may be present in both primary and secondary minerals. Primary minerals are those which were originally formed in rocks, such as gold, galena, &c. Secondary minerals are the result of oxidation of primary minerals from reaction with air and water. This process takes place at the surface and to a depth to which water and air can penetrate.

The occurrence of radio-active primary minerals, such as uraninite (or pitchblende), is in lode formations, shear zones or fissures, where they may be associated with the ores of copper, wolfram tin, cobalt, tantalum, silver-lead and iron, in the form of crystals, grains or irregular masses or veins.

They may also occur in pegmatite dikes within areas of older granites.

The secondary minerals of uranium, that is, the alteration products of the primary minerals, can be a good guide to the prospector because of their bright and striking colors, usually of green, yellow, orange and red.

They were formed by the weathering of the primary minerals and may occur as deposits in cracks or joints, as incrustations on the surface of rocks or minerals or scattered evenly through porous rocks.

Uranium-bearing minerals can occur in almost any established mineral field, particularly where ores of copper have been found. However, it is yet unexplained why most of the productive uranium lodes and veins have been found in regions occupied by very old rocks of the Pre-Cambrian age and, in particular, in association with the older Pre-Cambrian sedimentary rocks and the granites which have invaded them.

BROKEN HILL

The only part of New South Wales where such rocks are known to occur is the Broken Hill district in the far west. Radio-activity due to the presence of uranium has already been proved in several localities.

In one instance, it is associated with ores of copper and iron, in two other cases with ironstained material in silver-lead lodes, while in another case, the radio-activity arises from a zone of sheared and ironstained grey schist (rock of slaty structure).

This Pre-Cambrian rock belt extends across the border into South Australia to include such areas as Radium Hill.

It should be pointed out, however, that areas other than those in which Pre-Cambrian rocks occur are also likely to carry uranium deposits. In fact, all old mine workings and areas of mineralisation where other metals are known are worthy of prospecting for uranium.

The most prolific sources of commercial uranium are the primary mineral uraninite (including pitchblende) and the secondary minerals carnotite, davidite, autunite, torbernite, tyuyamunite and uranium ochres.

The uranium-thorium silicates, such as maitlandite, nicolayite, hydrothorite and pilbarite, are a few other radioactive secondary minerals, but, to date, they have been found only in small quantities.

There is no point in discussing radioactive thorium-bearing minerals, such as monazite, thorite, and thorianite, because no reward is offered for their discovery and the Government is no longer interested in the purchase of monazite concentrates.

To permit easier comparison, the characteristics of the main radioactive minerals are listed under separate headings.

Incidentally, where the word "streak" is used, it means the color of the mineral powder, which may be quite different from that of the metal in mass. For instance, in black hematite, the powder is red. The powder is obtained by scratching a mineral with a knife or file or by rubbing on a "streak plate."

URANINITE (PITCHBLENDE): Uraninite is the most important of all uranium-bearing minerals, as it may contain from 75 pc to 90 pc of uranium oxides. The color of the crystalline variety may be steely to velvety-black and brownish black, greyish or greenish. The streak may be brownish black, greyish or olive-green, and somewhat shiny.

BANDED STRUCTURE

The non-crystalline variety, which occur with sulphides and arsenides, is usually called pitchblende. It may show a banded structure from having been deposited in successive layers. This latter form may be mistaken for hematite, but can be rendered distinctive by the color of the streak, being red for hematite and greenish-black for pitchblende.

On casual inspection, it can easily be mistaken for tantalite, cassiterite, magnetite, wolframite, or ilmenite, as these have much the same appearance and are found under similar conditions. However, a characteristic of pitchblende is its weathering to yellow or orange-colored minerals.

In general, uraninite, or pitchblende, is a heavy, hard, black mineral with a submetallic to pitch-like lustre. Consequently, any such mineral occurring in a lode formation or in a vein or pegmatite should be investigated, particularly if its weathered surfaces are coated with a bright yellow or orange powdery deposit of some decomposition product.

Such coatings of secondary material are the only features of uraninite which are sufficiently characteristic to attract the attention of prospectors.

TORBERNITE AND AUTUNITE: These minerals are similar in general appearance and occur as alteration products from primary uranium minerals, often being found together in the one deposit, for example, Rum Jungle, in the Northern Territory and Mount Painter, in South Australia.

The two minerals are sometimes called "uranium micas" because of their occurrence in the form of thin mica-like plates, which commonly form an interlocking triangular pattern. They are usually present in outcrops of uranium deposits, particularly those occurring in pegmatites and as sulphide lodes.

Both minerals are quite soft and may be pulverised with the fingers. Autunite is a bright lemon yellow in color, while torbernite is a distinctive emerald green and has a pearly lustre.

TINY SCALES

These minerals commonly form tiny scales or coatings on cracks, joints or openings in weathered rock outcrops, but may also occur in the form of larger masses or veins scattered throughout a rock mass.

CARNOTITE AND TYUYAMUNITE: They are bright yellow, earthy or waxy-looking minerals, which occur in the form of a powder or as small scales. Carnotite is one of the more common secondary uranium-bearing minerals, with which prospectors should be familiar.

They occur as coatings on cracks and partings, as filling between grains in rocks containing primary uranium minerals, or scattered through porous rocks associated with other uranium minerals. At Radium Hill, South Australia, carnotite occurs as a yellow coating on davidite.

DAVIDITE.—Davidite is a complex titanium-iron mineral containing up to 8 pc uranium oxide. It is grey-black to black on fresh surfaces and is opaque except at the very thin edges, where it is translucent and olive-brown. It is hard, its streak is grey-black and it has a sub-metallic and shining lustre. When crushed it is just attracted by a powerful hand-magnet.

On weather surfaces there is generally an incrustation of carnotite (canary yellow) which usually serves to distinguish it from the similar mineral ilmenite, with which it is associated in the field. This is the case in the davidite deposits occurring at Radium Hill.

On present knowledge this mineral is the most important of the South Australian uranium minerals.

URANIUM OCHRES. — These are field names given to a number of secondary uranium-bearing substances which consist of uranium oxides usually combined with one or two of a number of other elements such as phosphorus, barium, calcium, lead and thorium.

OXIDATION PRODUCTS

These ochres are the final oxidation products of uraninite and are found in the oxidised region of veins or lodes which carry uraninite at some distance below the surface. They commonly occur as yellow powders coating surfaces or forming small veinlets and incrustations in weathered outcrops.

The ochres have a general resemblance to carnotite but they can be readily distinguished from it by their ability to fluoresce under ultra-violet light.

The presence of the bright yellow uranium ochres in a lode outcrop is important, particularly if the ochres

BUILD YOUR OWN!

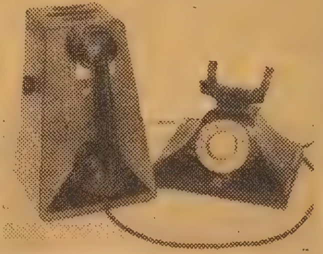
A KIT FOR EVERY PURPOSE!

Build your own radio, amplifier, test gear, etc. — it's good fun, simple, and saves you money. Electronic Parts Pty. Ltd. offers you a huge range of kits for "Radio & Hobbies" designs. Each kit is complete in every detail and uses only best quality components. Send coupon for our free kit-set catalogue.

- Fidelity 5
- 1950 Radiogram
- Junior Radiogram
- Little General 1946
- Little General 1952
- Wide Band 6
- Twin Speaker Mantel
- Super 8 Dual Wave
- Fireside 5 D/W
- Fireside 5 B/C
- 1951 Super 6
- Tablegram
- Minivox
- New Minivox 1952
- Holiday Set 1952
- All Band T.R.F.
- Babygram
- Xmas Box Mantel
- Kit No. 4
- Kit No. 1
- 1951 Advance
- 1952 Advance
- 1951 TRF Radiogram
- Super Three
- Simple Superhet
- "The E.P." Triple 6
- Multi Band 7
- 1953 "Little Jim"
- Vibragram 7
- Vibra 5
- Vibra 4
- Economy 5
- 32 Volt Vibrator Receiver
- Beginners' 1 Valver
- D/W Battery Five
- Kit No. 6
- Kit No. 2
- Jubilee Portable
- Carry-Set
- A.C. Unit for Carry-Set
- Senior Portable
- A.C. Unit for above
- Springtime Portable
- Portable Power Supply
- "Rambler" Portable
- 32 Volt Receiver
- 1952 Kar-Set
- 4 Valve Karset 1953
- 6/240
- Intercom System
- 1953 "Little Jim"
- Two Unit Intercom
- Wide Band 7
- Trawler Converter
- Porta Player
- etc., etc.

RECENT KIT ADDITIONS

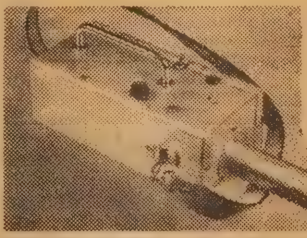
★ Telephone Amplifier



the latest best seller — amplifies telephone conversations—ideal for busy executives, etc.

★ PORTABLE GEIGER COUNTER

If you have the urge to go prospecting for radio-active minerals, here's a compact, lightweight unit you can build yourself for remarkably little cost.



★ A.C. Standard 5
★ 1954 Wide Band 6
★ New Fireside 5
★ Long Range 5

TEST EQUIPMENT KITS TOO!

Yes, we can supply kits to build your own test equipment—full details given in our free kit-set catalogue.

- AC/DC Multimeter
- 1in Oscilloscope
- Battery Charger
- Junior Signal Tracer
- Standard R.C. Bridge
- Switch Tuned Oscillator
- Elementary Oscillator
- Audio Test Oscillator No. 2
- Vacuum Tube Voltmeter
- "University" MK1 Multimeter
- "University" OK1 Oscillator
- New Modulated Oscillator

And Hi-Fidelity Enjoyment with a "PLAYMASTER"

There's a Playmaster kit (or completely built unit) to suit every requirement of the hi-fidelity enthusiast. These and other P.A. Amplifiers described in our free kit-set catalogue.

- Amplifier No. 1 (5 Valves 18 Watts)
- Amplifier No. 2 (5 Valves 10 Watts)
- Amplifier No. 3 (3 Valves 4 Watts)
- Ampilfier No. 4 (3 Valves 4 Watts)
- Amplifier No. 5 (5 Valves 10 Watts)
- Amplifier No. 6 (5 Valves 8 Watts)
- Vibrator Amplifier (6 Volt)
- Tuner No. 1 (2 Valve D/W & B/C)
- Whistle Filter
- Tuner No. 2 (3 Valve T.R.F. with Filter)
- Wide Range Tuner (1900 K.C. with Filter)
- Wide Range Tuner No. 2 (455 K.C.)
- Control Unit No. 1 (1 Valve with Vol. Cont.)
- Control Unit No. 2 (De Luxe Model)
- Control Unit No. 3 (Special Type)

ELECTRONIC PARTS PTY. LTD.
E. S. & A. BANK BUILDING,
206 BROADWAY, SYDNEY. N.S.W.
PHONE MA1661.
Telegrams: ELECPARTS, SYDNEY.

SEND FOR FREE CATALOGUE

which details all kits, together with prices, demonstrating that it's not only fun, but much cheaper to build your own.

ELECTRONIC PARTS PTY. LTD.
E. S. & A. BANK BUILDING, Cnr. Broadway & City Rd.,
Sydney. Phone MA1661.

Dear Sirs,

Please send me, without obligation, your kit-set catalogue.

Name ....

Address ....

are associated with iron-stained outcrops, because this points to the most important type of deposit.

Gummite is an end product of oxidation of uraninite but it is red, orange, or reddish-yellow in color and occurs in greater relative mass than the ochres. Furthermore, it may not fluoresce under ultra-violet light. Gummite may form a coating on partly weathered uraninite or may completely replace original crystals.

MAITLANDITE. — This uranium-thorium silicate is a vitreous black mineral found in pegmatites, which are very coarse-grained granitic rocks. It has a lustre of broken glass or quartz and has no definite crystalline structure. It contains about 35 pc of uranium oxides and about 25 pc of thorium oxide.

SILICATES

NICOLAYITE.—This silicate is a brittle yellow-colored mineral with a resinous lustre. Its structure is similar to that of maitlandite. It contains about 37 pc of uranium oxides and about 24 pc of thorium oxide.

PILBARITE. — This is another of these silicates. It is canary yellow in color and has a dull lustre. It contains about 27 pc of uranium oxides and about 31 pc of thorium oxide.

Because of the possible wide variations in the physical character of uranium-bearing minerals it is obvious that general experience will play an important part. Some assistance can be gained here by inspecting the collections in the various museums.

The most important deposits of uranium occur in lodes and veins in association with copper, silver, cobalt or nickel. Iron-stained outcrops should be searched for the typically yellow and green secondary uranium minerals, as their presence may indicate the existence of the most valuable type of deposit. In these occurrences quartz is commonly found to be smoky and stained in appearance.

Areas where cracks and cavities in granitic or allied rocks are filled with small patches of green platy minerals should be regarded with interest. They need not, of course, indicate the presence of a deposit of economic importance.

YELLOW COATING

Dark, heavy minerals with an incrustation of yellow, orange or reddish material, or with a light coating of canary yellow powder, should also be regarded with interest. An example is the mineral davidite found at Radium Hill.

The rock-types with which uranium minerals are most likely to be associated are granites and pegmatites, especially in areas where these rocks are apparently fractured and broken.

Any dark, conspicuously heavy mineral occurring in veins or pegmatites, particularly if surrounded by a bright yellow or orange crust, should be examined with special care and tested for radio-activity.

Sandstones and carbonaceous shales should not be overlooked as a possible area for sedimentary deposits. The uranium-copper minerals at Rum Jungle, Northern Territory, are found in carbonaceous slate which is replaced by the ore minerals, mainly along the bedding plane. These ore minerals appear to be concentrated where the graphitic slates are folded, and sheared and dragged around by faults.

From the prospector's angle, the interesting features of the Rum Jungle deposits are the poor surface indications, the association with copper minerals and the occurrence close to granite of graphitic slates which are considerably faulted and folded.

It is generally appreciated that the Geiger counter is one of the most valuable pieces of equipment with which to prospect for radio-active minerals. Nevertheless, a certain amount of experience is necessary in interpreting the indications before full value of the counter can be realised.

While low concentrations are fairly common, they are usually insufficient to be commercially workable. It is generally considered that unless an outcrop of ore produces about three to five times the background count of the instrument, it is unlikely to be of any value as a source of uranium.

Remember, of course, that the background count may well vary with the area and conditions of use of the instrument.

GEOLOGICAL INTEREST

On the other hand, weak activities may be of geological interest and deserve systematic observation. The idea would be to prepare a plan showing the distribution of the highest count readings and, as far as possible, their relationship to geological formations, dikes, fissures, &c.

As mentioned in the March, 1954, issue, the Minister for Supply is empowered to grant rewards for worthwhile discoveries of uranium-bearing ores. The Government is also prepared to purchase quantities of uranium ore and concentrates under specific conditions during a five-year period from August, 1949.

For further details, we would refer you to a copy of the pamphlet entitled, Radio-active Mineral Deposits, published by the Bureau of Mineral Resources, Geology and Geophysics, Department of National Development, 485 Bourke St., Melbourne, Victoria. This pamphlet also sets out the Atomic Energy (Control of Materials) Act, No. 34, of 1946. This Act should be read by all persons intending to prospect for radio-active minerals.

Changes in the Government's policy on these matters would be made public through the Government Gazette and, in the circumstances, it would be wise also to keep an eye on the contents of that publication.

FREE EXAMINATION

Owing to possible difficulty in visually recognising uranium-bearing minerals, the Department of Mines is prepared to examine and test, free of charge, any likely samples sent to them by a prospector.

The sample should be addressed to the Under-Secretary, Department of Mines, of the particular State, and should carry the sender's name and address on the outside of the package or on a slip of paper placed inside. A letter of advice, posted separately, should give the nature of the deposit, the approximate locality from which the samples were procured and should make reference to the fact that tests for presence of radio-active minerals are desired.

BARGAINS— BARGAINS— BARGAINS— AT

PRICE'S RADIO MAY SALE

A.W.A. Standard 3 gang Condensers	15/-
A.W.A. Miniature 2 gang Condensers	21/-
Morganite 1 meg Potentiometers with DP switch	8/9
Rothemel Crystal Pick-up Cartridges	10/6
Rothemel Standard size Sapphire Needles	5/6
Gas Filled Vibrators, 6V Heavy Duty	7/6
Double Button Carbon Microphones	3/6
Genemotors, 12/24V Input 250V 50 mA Output	25/-

Plus postage.

PRICE'S RADIO
5-6 ANGEL PLACE
SYDNEY

PROBE HOUSING

used with VTVM's, signal tracers etc. . . Heavy chrome-plated brass with moulded Polystyrene and fittings.

Retail Price 19/6

Distributors everywhere!

Watkin Wynne Pty. Limited
173 Pacific Highway, Nth. Sydney

TRANSONIC TRANSFORMERS, CHOKES

Standard and Special types made to order.

H.S.S. Crystal Microphones, Deck Stands, Connectors, and 45 rpm LP Disc Adaptors.

Special Fluorescent Ballasts, 20 and 40w. Std. Mtg. 37/6 post free.

Send S. A. envelope for Price List to:
Dept. RH5, Box 30 P.O., Balgowlah, N.S.W.

A C E RADIO

Amplification
Communication
Electronics

PHONE
LA 3845

136 VICTORIA R'D. MARRICKVILLE, SYDNEY, N·S·W

EVENINGS and WEEKENDS: "KALUA", COLLAROY ST., COLLAROY — XW5956
DULWICH HILL, UNDERCLIFFE, EARLWOOD TRAM AT DOOR. STOP No. 42

Brand NEW AR8-AT5 Equipment

in Original Factory Tropic Proofed Cases

The Receiver, Transmitter, Aerial Coupler & Shock Mounts and Circuits

£57/10/-

Will Separate Receiver, £32/10/-; Transmitter, £25; A.C.U.; £3.
Packing FREE! for Air or Passenger Rail. Goods Rail add 10/-.

ROTARY CONVERTERS

Input 24V to 32V DC
Output 240V AC 50 cycles
150 watts

£20/0/0

MARCONI 1155

Communications receivers

200K.c. to 17.5megs

10 VALVE. 5 BAND.
DUAL RATIO DIAL
CALIBRATED
FOR ALL BANDS.

£23/17/6

ATR 2B. TRANSCEIVERS

Crystal controlled. 20 Watt output. 3 to 7 meg. All standard Valves. Complete with crystal. Airtested. 12V operation. Will convert to other frequencies if required at slight extra cost.

£47/10/0

Heavy Duty Transformers

1500 x 1500, 750MA	10	10	0
750 x 750, 750MA	7	10	0
240/110 Auto 2.5KV	8	10	0
500 x 500, 500MA	4	10	0
500 x 500, 340MA	3	15	0
265 x 265, 250MA	2	5	0
365 x 365, 150MA	2	5	0
400MA Chokes	2	10	0
150MA Chokes	1	2	6
650MA Chokes	3	10	0

American Variable Transmitting Condensers

Suitable for TO 1200V.

100 P.F.	£1/1/-
60 P.F. with 50 to 1 Vernier Dial	£1
30 P.F.	10/-

CERAMIC FORMERS

Ribbed 2in Diameter. With mounts 6in long — — — 5/-

100 watt AERIAL RELAYS

Aerial changeover relays in metal case (24v). 18/6
A.W.A. 12v. Plastic Case £1

LIFE BOAT TRANSMITTERS

144 Meg., 1 Valve TX with Circuit £1/5/-

Post 2/6

WANTED

Transmitters, Receivers, Transceivers, Test Gear, Public Address Equipment. Top Prices, or will Trade-in or Exchange. State condition and price to above address.

NEW

VIBRATORS

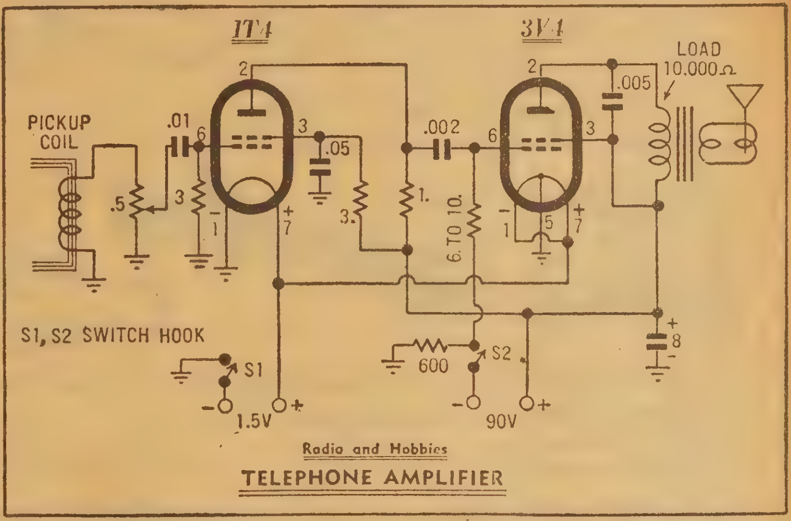
6V. A.W.A. GAS FILLED Synchronous, Heavy Duty
15/-

SIGNAL GENERATORS PHILIPS TAIOIC

Operates from 6V or 240V A.C.
390KC to 23MEGS.
AIR TESTED
PERFECT
ORDER **£32/10/-**

THE R. & H. TELEPHONE AMPLIFIER

The Telephone Amplifier described in the February issue has proven extremely popular and in this article we discuss a few minor points which appear to have worried some constructors, plus some extra data which we have acquired while using the original model over the last few months.



The modified circuit of the Telephone Amplifier which, with the mu-metal pickup coil should give considerable increase in gain. Main points are the increased grid resistor for the 3V4 and the increased HT voltage.

A POINT which appears to have confused most potential builders is the construction of the horn, and some additional data on this section may prove useful. Most of the confusion appears to have arisen from the drawing originally published on page 63 of the February issue and which, in order to conserve space, portrayed the drawing for the sides superimposed on the drawing for the body.

Unfortunately, a few readers interpreted this as indicating a portion to be cut out of the body section and were thus completely unable to picture the horn in its final form.

SHAPE OF HORN

To clarify this point we have prepared the accompanying drawing, showing the completed horn and detailing the placing of the sections shown in the original drawing. By comparing this with the original drawing, no one should have the slightest difficulty in constructing it.

Another important point is the sensitivity of the unit. Our original version was adequate in this regard, though there was not a great deal to spare. We considered this a desirable feature in one respect, since it minimised the chance of the violent feedback which could easily result from the combination of a high gain amplifier and the average non-technical office worker.

However, a few units made up by readers were somewhat lacking in sensitivity and it appears that a combination of small variables resulted in a performance somewhat below that of the original. Accordingly, we set out to see what could be done to improve the gain without involving any major changes.

As a result of these experiments we recommend three modifications, none very significant singly, but collectively capable of producing a worthwhile increase in gain. Having made these changes to our own original model, we found that rather than being just on the verge of feedback, as it used to be, it will now oscillate quite freely with most phone circuits, unless the gain is deliberately reduced.

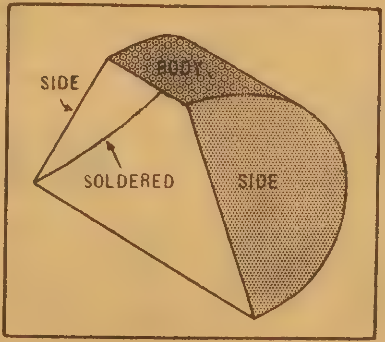
MU-METAL CORE

The first change is to substitute mu-metal for the stalloy core and pole pieces in the pickup coil. We tried this originally and formed the conclusion that the difference was not worth while and this is true when the change is made singularly. However, it probably amounts to about 2 db and is therefore useful when combined with similar gains made in other directions.

Mu-metal is fairly expensive and not readily available in large quantities, but there should be no difficulty in obtaining enough for this job in the form of scraps and off-cuts from normal transformer manufacture. At least one transformer manufacturer has intimated that he has ample supplies of such small pieces and will be glad to sell them for work of this kind.

The next step is to increase the grid resistor of the 3V4 to about 6 megohms, a step which will produce about 1.5 to 2 db gain and which once again, will not be noticeable when considered alone.

Because of the limited amount of heat generated by the small filament there appears to be little risk of grid current at this value, and we were unable to find any rating which prohibits this value. In fact, it might be quite safe to use a still higher value, say up to 10 megohms, but there would be little point in going higher than this, since the useful benefit brought about by the reduced shunting would be negligible thereafter.



A drawing of the completed horn showing how the parts described in the original article are assembled. The body is folded into a rough semicircle and then shaped to fit the two end pieces.

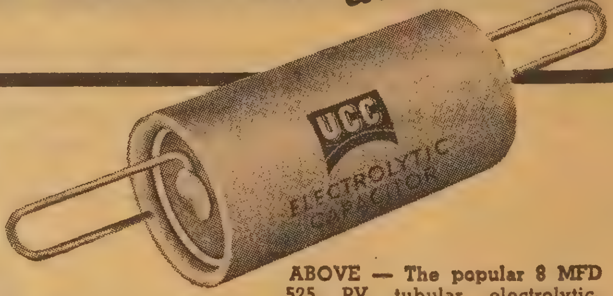
90v. SUPPLY

Next, an increase in HT voltage from 67.5 to 90 will contribute a similar share to the overall improvement and there is plenty of room in the battery compartment to accommodate the larger battery (490P or similar).

In this way an overall improvement of something like 6 db should be realised and this should be sufficient to cope with the small variables likely to be encountered in ordinary components. If it appears that substantially more gain than this is required it would suggest that the amplifier is not working as it should and that it should be carefully checked for faulty components, or wiring.

In some cases, depending mainly on the individual potentiometer and IT4 valve, it may be found that the volume control is noisy. This can almost always be cured by fitting a separate grid resistor to the IT4 valve and coupling the grid to the potentiometer through a capacitor. Suitable valves would be a 3 meg. half-watt resistor and a .01 mfd capacitor. This may also improve the gain slightly.

UCC ELECTROLYTIC CAPACITORS *last longer!*



CONSIDER THESE ADVANTAGES

Long life ● Reliable service ● Small size ● Wide operating temperature range ● Highest quality materials ● Closely controlled manufacturing processes ● Individually tested and inspected to rigid standards ● Ratings 1.5 to 600 PV, 1 MFD to 2000 MFD ● Range of mounting styles.
Always specify UCC
Obtainable from all leading Distributors

ABOVE — The popular 8 MFD 525 PV tubular electrolytic, cardboard sleeved, with pigtail connections — shown full size.

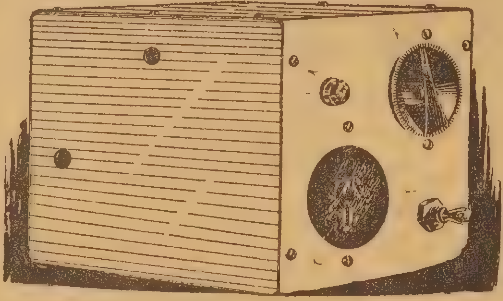
UCC *Capacitors for every application*

UCC¦P.2

FOR FURTHER INFORMATION CONTACT:—

UNITED CAPACITOR CO. PTY. LIMITED • 433 PUNCHBOWL RD., ENFIELD • LF 3511

MELBOURNE: U.C.C. Pty. Limited, 486 Bourke Street.
ADELAIDE: Stephen & Co., 83 Grenfell Street.
BRISBANE: Tecnico Ltd., 103 Albert Street.
PERTH: O. F. Gamble, 384 Murray Street.
N.Z.: H. W. Clarke (N.Z.) Ltd., 42 Cable Street, Wellington.



THE JEWEL AUTO PACK

Installed in your car, caravan, boat, camp, etc., it gives 230 volts AC from 6, 12 or 32 volts DC. Plug your present mantel radio in and you have a car radio. Also suitable for most electric shavers, economical on battery, compact in size (6in x 5in x 4in).

COMPLETE WITH INSTRUCTIONS, MOUNTING BRACKETS, ETC.

£11/19/6

Features Include:—

- ON/OFF SWITCH
- INDICATOR LIGHT
- CURRENT SAVING SWITCH
- UNIVERSAL MOUNTING

TRADE INQUIRIES INVITED.

AUTO PACK JUNIOR

This unit is expressly designed for the operation of electric shavers. It gives 230 volts AC from 6, 12 or 32 volts DC and will operate the following types: REMINGTON, SCHICK, PHILISHAVE, AC/DC, SHERNAL, SUNBEAM.

£7/9/6

Order now for immediate delivery or post for full information to **REID'S RADIO SERVICE, 412 Bridge Road, Richmond, Victoria. Phone: JB3023.**
Make a cross over circle for type required:—
State Input Voltage
● JEWEL AUTO PACK ● AUTO PACK JUNIOR

NAME ....

ADDRESS .... R.H. 2

FROM THE SERVICEMAN WHO TELLS

I struck another of those "All servicemen are sharks, I've been done" type of customers recently and a few comments on his complaint may not be out of place. I also have an interesting intermittent fault which I managed to solve in rather unusual circumstances.

THE customer told the story of "a bloke he knew" whose set had failed and a serviceman who had quoted him a figure in the vicinity of £20 to repair it. "Of course, it was a pretty old set," he went on; "must have been made a few years before the war."

"Still, this bloke thought twenty quid was a bit steep, so he took the valves out and took them to another shop and had them tested. One was bad, so he bought a new one, took it home and put it in the set, and it went as well as ever. Pretty steep, y'know, twenty quid just to replace a valve."

A HOT PRICE!

I agreed it did seem "a bit steep", but suggested that there could quite easily be a lot more to the story than the bare facts he had heard and that it would not be difficult to make an excellent case in defence of the serviceman. Of course, it would be mostly assumption, so, to put things on a more realistic basis, I mentioned the case of one of my own customers and which, to my mind, was very similar.

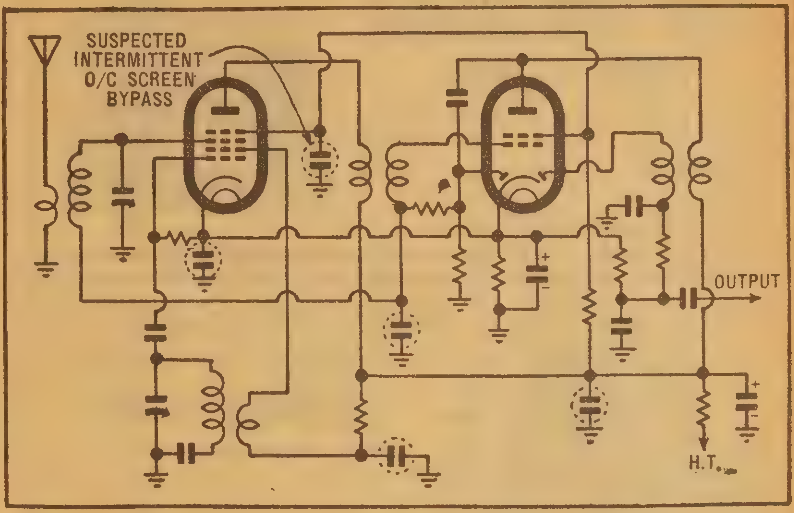
Since my customer was not technically minded, I was forced to deal with things in a general way. Nevertheless, I think I told the story well enough to convince him that there might be another side to the case and that perhaps the serviceman concerned was nothing more than a good businessman.

In somewhat greater technical detail the story is as follows: The set was a commercial version (and quite well made, too), of the old Wireless Weekly "1933 Standard". It had performed excellently over the greater portion of its life, but now, at the age of 21 years, the effects of senile decay were making themselves felt.

The owner was fully aware that it had run its useful course and agreed that it was time she purchased a new one. However, her future activities were rather uncertain and she had asked me to try to keep the old warrior going for a while, perhaps 12 months, perhaps two years, until she was more settled. I had, therefore, agreed to carry out a bare minimum of service to put the set in working order.

PAST HISTORY

As a matter of fact, I detailed my first encounter with the set in the May, 1953, issue, and readers may remember that there were three faulty valves (not counting one I blew up in the process of testing), an open circuit RF coil, which had to be re-wound, and sundry minor faults. When these were fixed the set performed quite well and the owner considered the cost, though rather high, to be fully justified.



Unfortunately, it wasn't long before another valve tossed in the towel, necessitating another service call, and then, just recently, my services were again sought—the speaker had cracked up.

This time I called a halt. Speakers of that vintage are almost impossible to repair, and, even if they can be fixed, the process is not cheap. New speakers are not cheap, either, particularly when one adds the cost of fitting dropping resistors, chokes, &c., and generally modifying the circuit to accommodate them.

Thus, whichever way it went, the owner was committed for a considerable outlay, with no guarantee that some other part of the set would not fail in a few weeks' time.

I pointed this out to the owner and advised her very strongly to cut her losses at this stage, give the thing a decent burial, and invest in a new one. I am happy to say that she took my advice.

COST OF OVERHAUL

And what has this to do with my disgruntled customer? Just this: The set I have just described is typical of those made around this time and I suspect that the one described as being made "a few years before the war" would not be very much younger. (After all, any set made before the war must be at least 15 years old.)

Had I tackled the old "Standard" on the basis of a complete overhaul to put it back into tip-top operating condition, good for another five years at least, I doubt whether I could have done the job for the "twenty quid" which was getting our friend so hot and bothered.

For a start, any valve which has been in constant use for more than 20 years is due for replacement in a general overhaul, almost regardless of the indications of the valve tester. Assuming that all the valves could be fairly recognised as the originals (they were in my case), there is quite a substantial amount involved to replace these alone.

OLD VALVES DEARER

It is not always appreciated that the older, superseded types are generally dearer than their modern counterparts, due to the need to make them in small quantities for replacement purposes only.

There is also the possibility that some of the types required will be no longer available, necessitating the selection of a suitable replacement, the fitting of a new socket (often with mechanical complications), and, in some cases, an auto transformer to take care of the new filament voltage.

Next point is the coils. One of these had already failed (in several places), and, impregnation, or lack of it, being what it was twenty years ago, it is quite a reasonable assumption that the others could go the same way. So we fit a new aerial, RF, and oscillator coil, plus a pair of IF's and add a few more pounds to the bill.

LABOR COSTS

Admittedly the cost of the components is not excessive, but stop for a moment to consider the work involved. First one must obtain suitable replacement coils. This usually involves a certain amount of searching, a special order, and several

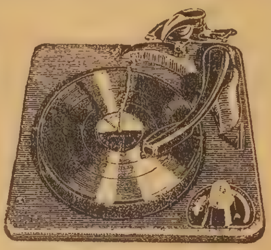
THE WARBURTON FRANKI PAGE

EVERYTHING FOR THE RADIO HOBBYIST . . .

CHECK IT EACH MONTH . . .

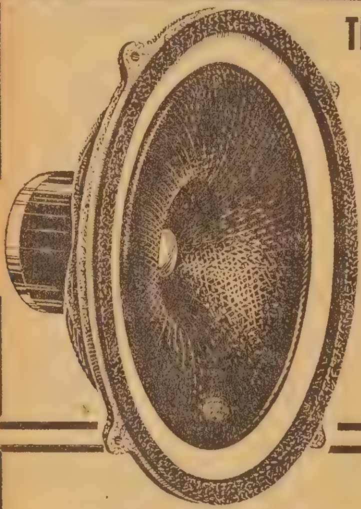
All Records sound better on the

VELVET ACTION AUTOMATIC RECORD CHANGER



Latest Model 104 (illustrated) Plays all 7in, 10in, 12in records automatically—Standard or Microgroove at 33⅓, 45, 78 r.p.m.

Price £26/5/9



The remarkable BAKER 12" TRIPLE CONE CLOTH SUSPENDED SPEAKER

***Brief Specifications*—** Frequency range 18 to 17,000 CPS. Flux Density (approx.) 15,000 Lines per sq. CM. Maximum Peak AC Input 15 Watts. Fundamental Resonance (approx.) 35 CPS. Voice Coil Impedance 15 OHMS.

Price £25/16/3

NEW "MODERNE" SPEAKER CABINETS IN TWO-TONE LEATHERETTE

6 inch **41/-**	8 inch **45/1**
10 inch **53/-**	12 inch **57/11**

LATEST MODEL 3-SPEED RECORD PLAYERS NOW AVAILABLE

GARRARD	£15/5/7	CABINET to suit	125/9
PHILIPS	£12/7/6	CABINET to suit	115/-
B.S.R. GU4C	£13/15/-	CABINET to suit	125/9

B.S.R. MU14 MOTOR AND TURNTABLE ONLY 145/-

CABINET FOR VELVET ACTION CHANGER .. 150/11

Latest Releases From Warburton Franki's Vast Stocks

Acos H.G.P.40 Pickups	**£9/15/-**
Acos H.G.P. 39 Std Hds	**£3/12/6**
Acos H.G.P. 39 L.P. Heads	**£3/12/6**

Geloso Italian Crystal Microphones

Model T 30 Bakelite	**£3/12/-**
Model M400 Ball Type Chrome Plated	**£5/19/11**
Model M401 as M400 But complete with base	**£6/16/1**
Model B 80/1100/V De Luxe with base and volume control	**£8/19/5**

Write for illustrated pamphlets on Geloso & Zephyr Microphones.

Detachable Car Aerials

Now no need to advertise your car radio to thieves or vandals.

3 pce side mount type	**70/-**
3 pce top cowl complete with lead	**113/-**

REPLACEMENT NEEDLES for Acos GP20

Standard or Microgroove **14/3** fitted SAME DAY SERVICE available CHANCERY, DECCA, COLLARO, SHURE, ASTATIC, ACOS GP. 29 AND HGP 33 HEADS.

WARBURTON FRANKI (MELB.) LTD.

380 BOURKE ST., MELBOURNE, C.1... PHONE: MU6355

Open Saturday Mornings

Trade Supplied

. . . POSTAGE OR FREIGHT MUST BE INCLUDED WITH ALL ORDERS . . .

days' delay before they are ready on the workbench.

It is almost certain that they will differ physically from the original types, meaning that adapter plates have to be made and fitted before one even tackles the wiring. Believe me, you won't knock that job over in a couple of hours.

Then there's the speaker. If you're lucky it will still be intact, or, at the worst, have an open circuit transformer. But more than likely (as in my case), the cone will have started to buckle, or fracture around the edges, resulting in a certain amount of mis-alignment.

Of course, you can try re-aligning it in the time-honored fashion with three strips of thin card, and in some cases such an approach is fully justified. But would you like to guarantee such a job for more than a few months if the cone was already "on the way out"?

NO ORIGINAL LEFT

No, I wouldn't either, so it's a new speaker or nothing, and for the reasons I have already stated, a new speaker in such circumstances is an expensive business, plus the fact that the whole situation is rapidly getting out of hand.

There is a real possibility that there will be very little of the original set left by the time the overhaul is complete, reminding one of the story of the valued relic which the proud owner claimed to be the original George Washington's hatchet. On closer questioning, he admitted it had had five new heads and nine new handles!

This then, I suggest, was approximately the situation which prompted the serviceman to quote such a high figure to repair the set. Admittedly, he was assuming a lot more work than the owner considered necessary, but I further suggest that it was another of those misunderstandings between customer and serviceman as to just how much work needs doing.

The customer considers that all that needs to be fixed is the last thing to fail; the fault which, in fact, stopped the set completely.

The serviceman, on the other hand, can see many things which need doing, even at a quick glance, and reasonably assumes that there will be many more uncovered when he tackles the job in earnest. So, to protect his reputation, he shies clear of the "patch it up" approach and quotes what he thinks is a fair estimate of the work to be done.

AVOID MISUNDERSTANDING

In reality, such a set is just not worth repairing, particularly when one considers that a new set could be bought for not much more than the cost of repairs, and that it would have many improvements which the old one lacked. This, in effect, was what the serviceman was trying to say when he quoted his figure of £20.

Unfortunately, due to a certain amount of reticence on the part of both parties, they never really brought the problem to a mutually satisfactory level. It is on this point, rather than the figure which he quoted, that I would condemn the serviceman, because he should know, even if the customer doesn't, just how necessary it is to get all the facts straight to avoid such a misunderstanding.

Another interesting case I experienced recently was one of those "unofficial" kind of jobs which crop up from time to time outside the normal run of business. Although normally unremunerative in the financial sense, they can still represent valuable experience, since they are frequently of an unusual nature. (They also help to maintain my stocks of interesting stories against those drought periods when nothing unusual seems to happen.)

In this case I happened to drop in on a friend who dabbles in the noble science and found him putting the final touches to his latest creation; a tablegram type of unit which he had undertaken to construct for an acquaintance. In reply to my question as to how the project was going, he replied that it had exhibited one unpleasant characteristic which had him rather puzzled and he hoped I might be able to help.

To bring me up to date on the story he explained the circuit, showed me the "works", and related the symptoms which were worrying him. It seemed the set used a fairly standard five-valve circuit but was divided mechanically into two separate units to facilitate mounting in a reasonable size tablegram cabinet. In addition, there were the usual interconnecting cables between various units; motor, pickup, selector switches, chassis and so forth, making a moderately complex set-up.

TUNER TROUBLE

My friend explained that the trouble was in the form of oscillation in the tuner portion (or at any rate it appeared to be there) and that he had noticed it when he had first assembled all the units into the cabinet for a tryout. All went well for the first half hour or so, after which the tuner became quite unstable and would only perform normally when tuned to a powerful local station.

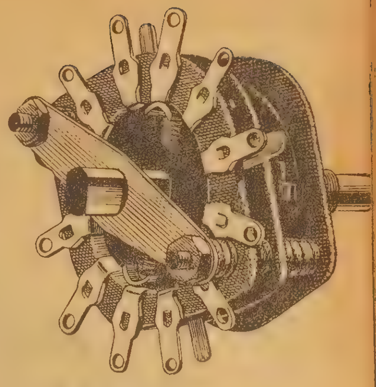
The trouble seemed quite definite and permanent, so my friend assumed that it would simply be a matter of removing the chassis and making a more or less routine check to find the offending component. So, muttering darkly, he reefed the tuner out of the cabinet, made temporary connection to the remainder of the gear and switched on. Lo and behold, the trouble had vanished and, what was more, it flatly refused to return, even after prolonged test runs spread over several days.

Normal checking failed to reveal anything obviously wrong and, with no sign of the fault, he began to doubt the accuracy of his own observations and whether there really had been something wrong. (Don't I know the feeling.)

Finally, he fitted the chassis back in the cabinet and tried again. Still no luck, the set performed perfectly, and my friend was faced with the sticky situation of suspecting that there was something wrong with the tuner but being unable to locate it, and having to deliver it to his customer. Naturally his confidence was badly shaken.

This was more or less the state of things when I arrived, and he was doing a little cabinet trimming before giving it a final test, having decided that the surest way to make it fail was to deliver it anyway. (Drastic measures, he admitted, but then he considered it a drastic case.)

So he switched it on and we both expressed the hope that it would fail



PALEC ROTARY
10 AMP. **SWITCH**
(Aust., Brit. & U.S. Patents pending)
RATING—10 Amp., 250 V.A.C.
CONTACTS—
Silver Plated—non-shorting only.
Resistance—800 Micro-Ohms.
TEMP. RISE ON CONTACTS—
(with 10 Amp. Conductors)
at 10 Amperes 10° C. rise
at 20 " 30° C. rise
at 30 " 50° C. rise
DECKS—1 to 8 max.
POLES PER DECK—
1 Pole—max. 12 contacts
2 Pole—max. 6 "
3 Pole—max. 4 "
4 Pole—max. 3 "
OVERALL DIAM., 2-1/16 in.
TECHNICAL SERVICES—
We will design and build
Switches to requirements.
Available—leading Wholesalers.
Quantity prices on application to:
PATON ELECTRICAL PTY. LTD.
90 VICTORIA ST., ASHFIELD, SYDNEY

LOW VOLTAGE
PHOTOFLASH CAPACITORS

"Lectroflash" Type SCE60HE is the ideal capacitor for use in the low voltage electronic photoflash unit described in "Radio and Hobbies" for April, 1954.

RATING: 650 MFD. 250 volts peak working.
SIZE: 4½in long x 1¾in diameter.
WEIGHT: 9 ounces.
RETAIL PRICE: 40/7 each.
(Inc. 16-2/3% Tax)
Also available in other ratings.
Obtainable through your usual supplier.
TRADE ENQUIRIES TO—
UNITED CAPACITOR CO. PTY. LIMITED,
433 Punchbowl Road, ENFIELD, N.S.W. LF3511.
486 Bourke Street, MELBOURNE VIC. MU5693.
UCC
UCC.41

NEW

Agfa

NEW

MAGNETON TAPE FS.

TECHNICAL DATA

SENSITIVITY: The Agfa Magneton Tape FS for tape speeds of 19 and 9.5 cm/sec. ($7\frac{1}{2}$in and $3\frac{1}{2}$in/sec) has a sensitivity of plus 14 plus/minus 1 db for 1 kc/s, measured at 76.2 cm/sec, optimum premagnetization and related to the standard broadcasting tape (plus/minus 0 db).

FREQUENCY RESPONSE: The Agfa Magneton Tape FS has a frequency response of at least plus 5 db.

DISTORTION FACTOR: The distortion factor is lower than 0.5 per cent, measured as proportion of the 3rd harmonic (3 kc/s) of 1 kc/s. Thus the low distortion factor of the "FS" Tape ensures a particularly good and undistorted reproduction.

MODULATION NOISE: 30 db.

Available from Distributors and Dealers throughout Australia

SOLE IMPORTERS: HENRY H. YORK & CO. PTY. LTD.,
MELBOURNE — SYDNEY

and perhaps give a clue to the cause. At first the set performed quite normally and it looked as though our luck was out, but I suggested that we let it run for a while and try again. So we turned the volume down to a background level and chatted of this and that for half an hour or so while the set played without apparent change.

At the end of this time we turned the volume up and tried again. It must have been our lucky day, because as soon as I tuned to one side of the carrier, the set became hopelessly unstable, giving forth violent heterodynes on all the weaker carriers as well as the local ones, until tuned exactly to resonance.

SCREEN BYPASS?

My first and immediate impression was that of an open circuit screen by-pass. Perhaps it was merely what our American friends call a "hunch", or it may have been simply that such a fault is the obvious one, but the more I fiddled with the thing the more convinced I became that this first impression was right.

To support my theory on a more scientific basis I could only point out the violence of the oscillation and the fact that I had never known any other cause, short of obvious ones, which we had already checked, to produce such an effect.

My friend did not disagree with me, but wanted to know, if I was right, how we were going to prove it. He was convinced that by the time we had removed the tuner from the cabinet the fault would have vanished and we would be right back where we started. Knowing the perverse nature of intermittents in general, I was not prepared to argue on this point, but I had an idea that it might be possible to prove the point, on the spot, and without recourse to prolonged testing and special equipment.

Assuming that the fault would vanish as prophesied, I proposed to observe the exact nature of the oscillation—strength, variation with dial setting, &c—then attempt to recreate the fault after the set had returned to normal. If I could do this it would be a fairly safe bet that we were on the right track.

So we made our observations and then tackled the job of removing the tuner. Unfortunately, as is often the case with such equipment, there were quite a number of cables to be uncoupled before the tuner could be removed, and it had had plenty of time to cool down by the time we were able to get it operating again in an inverted position on the bench. Alas! As my friend had prophesied, the fault had vanished.

THE REAL TEST

Now came the real test. If the screen by-pass was really the culprit the set should behave identically if this was removed. If not, we should have to look further afield. Accordingly I unhooked the earthed end and was immediately greeted by violent oscillation. This, of course, was more or less expected, the important point being whether the general performance was now similar to our previous observations.

After tuning over the band and carefully observing all the symptoms, we both agreed that, as far as we could judge, they were identical.

WATCH THOSE MFD's

WHEN replacing electrolytics in receivers, particularly older types, some servicemen are tempted to fit larger values of capacitance such as the 16 or 32 mfd types, which have become available since the receiver was designed.

The idea behind this is undoubtedly to improve the performance of the set by reducing hum, but is not always realised that such indiscriminate alteration of values is not always in the best interests of rectifier life.

This applies particularly to the first electrolytic which presents a very heavy load to the rectifier when it is in a discharged condition, and the only other factor limiting the flow of current is the transformer secondary impedance. If this is low enough the peak current at the commencement of the cycle can easily be higher than that recommended by the valve manufacturers, resulting in reduced rectifier life.

The second electrolytic is not quite so critical since there is the resistance of the filter choke between it and the rectifier, and so it may be made as large as space and economy permit.

This just about clinched the matter in my own mind, but it seemed worthwhile to be as certain as possible, so we went over the chassis and lifted, in turn, every other by-pass.

The only other one which I considered likely to cause similar symptoms was the HT decoupling by-pass, but removal of this made no noticeable difference. Removal of the AVC by-pass made the thing a trifle "swishy" but did not produce anything like the original fault, while the cathode by-pass seemed to drop the gain only slightly. No doubt the AVC masked the real effect.

That only left the oscillator HT by-pass, and removal of this stopped the set completely by killing the oscillator circuit. Once again this was exactly what one would expect.

TROUBLE CURED

As a result of these observations I felt that we had pinpointed the trouble just about as surely as one can for any intermittent (unless one is extremely lucky), and suggested that a new screen by-pass should virtually eliminate any risk of the set bouncing on the score of that fault.

This was done and the set delivered to the customer, my friend making a point of checking back a couple of weeks later to see if all was well. Apparently it was, because the customer was perfectly satisfied and there was no sign of the fault.

It seems almost certain that heat was the variable factor in this case, and that when the unit was in the cabinet there was a much greater chance that the faulty condenser would get hot enough to give trouble. On the bench or in the cabinet when the weather was cool it might run indefinitely without a falter, but a few degrees increase and bingo, open circuit!

Thus another redskin bit the dust (and I was practically unarmed, too)

AWA RONETTE

MICROPHONES & ACCESSORIES

Type R572
£18-19-9
(High impedance)

Type R572/L
£22-4-9
(Low impedance, 200 ohms, duo cell omni-direction)

Other types also available from

NOYES BROS.
36 Argyle St., Hobart
and leading wholesalers.

RADIO ACCESSORIES

We specialise in Radio Parts and stock all reliable brands. We can supply: Coils, I.F.'s, Transformers, Resistors, Tubular Condensers, Valves, Wires, Flex, Meters, Testing Equipment, Radio Manuals, Irons, Toasters, Pressure Cookers, Jiff Toasting Irons, Trimmers, Padders, Gang Condensers, Motor and Pickups, Record Changers, Cabinets, Solder Irons, Solder and Electrical Accessories, 4 and 5 Valve Mantel Sets — Portable Sets, Console Radio and Radiogram, etc. Mantel, Console and Radiogram Cabinets. TECNICO Electric Lawn Mowers, Floor Polishers and Vacuum Cleaners.

2 and 3 Speed Motors and Turntables.

G.P.20 Pickups and Microgroove Heads.

DAVIS RADIO CO.

Wholesale Radio Distributors,

1st Floor, Wembley House,
841 George St., Sydney.
Next Glaciarium

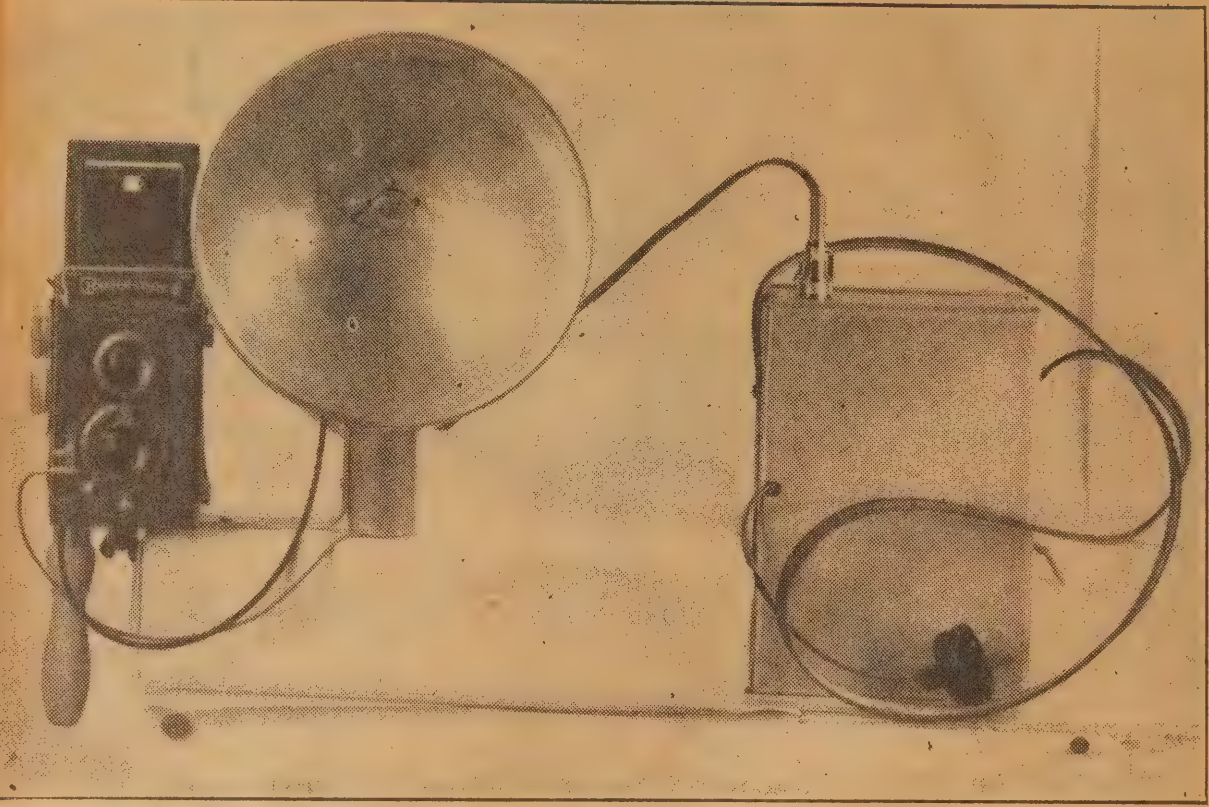
Phone M3917

OPEN SATURDAY MORNINGS

MAKE MONEY AT HOME

Learn pleasant, profitable pastimes. We teach all Modern Moneycrafts. Special Postal Courses. Designs and Patterns FREE. Profit in spare time. Dept. B, Le Bon College (regd.), Box 279 Haymarket, Sydney.

Pocket Book
STORYTELLER WEEKLY
HAS THE PICK OF THE WORLD'S BEST STORIES



The complete Electroflash with the gun mounted on the camera. Note the power cord emerging from the small opening in the side of the case and the handle used to support the camera-gun assembly.

AC POWER FOR ELECTROFLASH

Following our description last month of a dry battery operated Electroflash we are describing an AC operated power pack which can be used to replace the batteries when commercial power is available. We also describe a modification to the circuit, some experiments with HP3, and other hints on using the equipment.

FIRST, the modification. As we explained last month it is not possible to switch in an extra bank of capacitors unless some precautions are taken to prevent a heavy discharge from one bank to the other, with possible serious damage to the switch.

In our original circuit, we overcame this by connecting the two banks together with a 5000 ohm resistor, this serving to keep the two sections at the same voltage level, though effectively isolating them as far as the discharge circuit was concerned.

DISADVANTAGE

This scheme worked quite well, but it had the slight disadvantage that both sections had to be charged initially even if only one was to be discharged. For subsequent charges the charging time was reduced to a normal figure for a single bank.

Our modified circuit provides for more complete isolation of the two banks, though it is not quite as foolproof as the original scheme. Reference to the circuit will show that the coupling resistor is now only 150 ohms, and that it is only in circuit when the switch is in the "OFF" position.

Since this is located between the "LOW" and "HIGH" positions, it is impossible to switch from one to the other without bringing this resistor into circuit, thus balancing the two banks before switching them permanently in parallel.

by Philip Watson

The only precaution to be observed is to pause long enough in the "OFF" position to enable a reasonable balance to be achieved before completing the switching movement. With the value chosen the process is quite rapid, a one-second pause being adequate.

In fact, it appears to be sufficeint to simply make the change in two separate movements, though it would be asking for trouble to attempt a "straight through" change in one movement. Changing down from "HIGH" to "LOW" does not call for any precautions.

RESISTOR MOUNTING

In practice the 150 ohm resistor is a one-watt type mounted on the switch, and no difficulty should be experienced in finding room to accommodate it. However, make sure that the pigtails are insulated with spaghetti sleeving to avoid short circuits between the various switch contacts.

As we mentioned in a preliminary article, there appears to be one objection to the use of dry batteries for this work, and that is the large number of flashes (at a considerable outlay) which must be purchased at one time and the fact that these should be used within a reasonable time, between six and nine months, if the self deterioration of the batteries is not to rob the user of much of their life.

For this reason the casual user may be better served by an alternative source of power, even though it may lack some of the obvious advantages of the dry batteries. Two suggestions immediately come to mind: A vibrator pack powered by a small accumulator and a simple power transformer and rectifier arrangement to permit operation from the mains.

The vibrator arrangement will no doubt appeal to many, and we are working on such a unit at the present time. All being well we hope to describe it in the June issue.

In the meantime there is plenty of evidence that a simple mains operated unit will also appeal (almost the first mail after publication brought just such a request), particularly if matters are so arranged that the unit is interchangable with dry batteries if required.

PRACTICAL ARRANGEMENT

Although mains operation implies certain restrictions, it is quite likely that these will not prove as serious as may be imagined. After all, most routine work as undertaken by the advanced amateur or professional is within easy reach of a power unit, and, provided a reasonable length of flex is carried, the arrangement is quite convenient.

When we also consider that the running cost is virtually nil, and that there is nothing to deteriorate when not in use, the scheme begins to look very attractive.

At this stage, however, we would like to sound a warning. Many flash units described in overseas publications, both English and American, work directly from the mains through a dry rectifier without the refinement of a transformer. While this is certainly simple and avoids the cost and weight of a transformer, it has two serious disadvantages.

One is the possibility of overrating the electrolytics, since the peak voltage from such a system can quite easily rise to something like 350 volts under the no-load conditions at the end of the charging cycle.

Of course it is possible to reduce this by means of resistance networks but it is difficult to arrive at a satisfactory arrangement which does not generate more heat than can be conveniently radiated from a small case.

DANGER

The other—and far more important—possibility is the very real one of the operator receiving a serious shock from such equipment, under certain conditions which can quite easily arise. When it is remembered that one side of the circuit ultimately connects to the frame of the camera in order to complete the triggering circuit, it will be appreciated just how dangerous this can be.

If we could always be sure that the same pin in any power point was always the earthed side of the supply there would be less danger but, as it is, there is every chance that the camera frame will be connected to the live side, ready to shock the operator who touches an earthed object.

All things considered, we prefer the conservative, and infinitely safer, idea of using a properly designed transformer for the job.

Before describing our unit in detail it may be as well to consider some of the characteristics of the electrolytic capacitors, particularly the effect of applying higher than normal voltages.

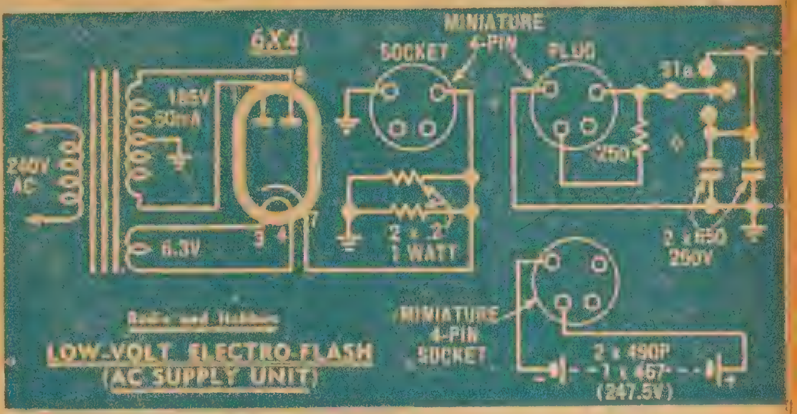
This is particularly important because it is difficult to provide a power supply which will always deliver exactly the correct voltage, regardless of line voltage fluctuations, and also provide a reasonably fast charging time. For this reason it is inevitable that small overloads must occur unless the unit is so designed that it will be working much below normal voltage on most o casions.

The paper capacitor, as used high voltage systems, is not troubl by short applications of overlo voltages (a typical 2500-volt ty would be a flash tested at 40 volts) but will have its life ser ously shortened by the continue application of even its rated vo tage.

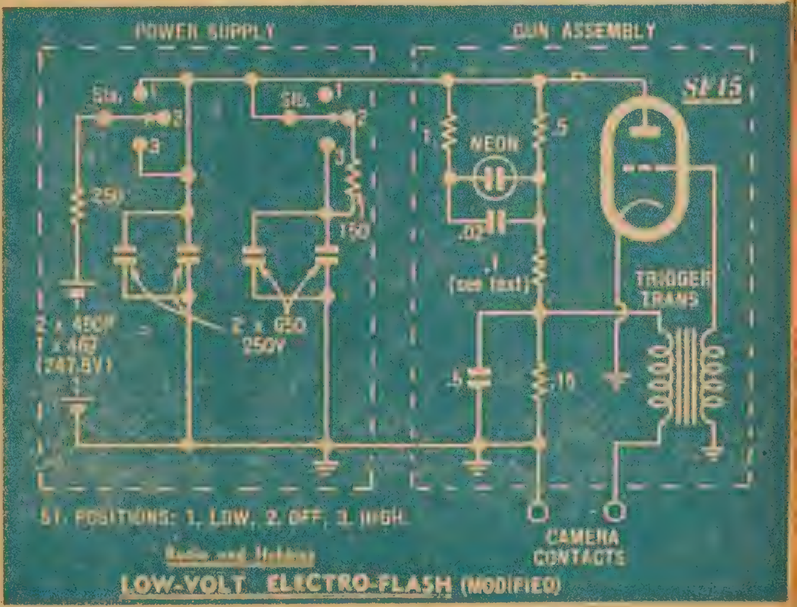
The electrolytic capacitor, on th other hand, may be run for lo periods at its rated voltage witho harm and, in fact, its performan will improve the longer the volta is applied. However, it does n take so kindly to overload voltag and the leakage current rises fair rapidly once the normal voltage passed. If this leakage current allowed to become too great, co siderable heat will be generated a the capacitor will be destroyed.

For this reason the makers recommend that a mains-operate power supply should have sufficie

CIRCUIT FOR THE POWER SUPPLY



The circuit for the power supply is extremely simple, the most important part being the plug and socket arrangement used to permit interchange of batteries and power supply.



The modified circuit of the dry battery Electroflash. The main alteration is the value and position of the balancing resistor.

A.C.E. RADIO

Amplification Communication Electronics

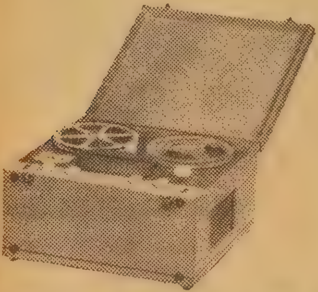
PHONE:
LA 3845

136 VICTORIA R'D. MARRICKVILLE, SYDNEY, N·S·W

EVENINGS & WEEKENDS: "KALUA", COLLAROY ST., COLLAROY — XW5956

DULWICH HILL, UNDERCLIFFE, EARLWOOD, TRAM AT DOOR. STOP NO. 42.

TAPE RECORDER by A.C.E.



Features a 1954 Recorder should have

FAST FORWARD	FAST REWIND
3 MOTORS	2 SPEED 7½ & 3½
PUBLIC ADDRESS FACILITIES	PROVISION FOR TUNER
RECORD LEVEL INDICATOR	BASS & TREBLE CORRECTION
MAGNETIC BRAKES	ELECTRONIC ERASE
EXTERNAL SPEAKER OUTLET	MIKE, PICKUP & RADIO INPUT
HIGH FIDELITY HEADS	OPERATE IN ANY POSITION
SIMPLICITY OF OPERATION	GUARANTEE

All This and More in A.C.E.

£84/17/6

Complete with crystal mike, tape and ready for work.

TUNER UNIT, £12/17/6

SCOTCH BOY TAPE

£2/17/6

COLLARO MOTORS

FOR THAT TAPE DECK

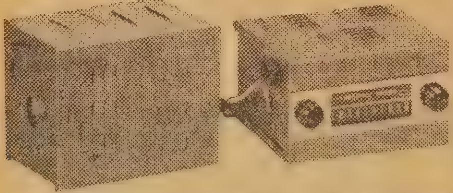
£2/12/6

RECORD & ERASE HEADS

HIGH IMPEDANCE
HIGH OUTPUT
HIGH FIDELITY

£3/17/6

KAR SETS



£27/17/6

A FULL RANGE OF CAR RADIOS TO SUIT ALL PURSES AND PURPOSES. Outstanding performance. Simple installation. Complete with aerial to suit you. Side, windscreen or cowl mounting. All installation, acessories guaranteed.

5 VALVE	£27/17/6	5 VALVE A.C. OR6 OR 12 VOLT UNIVERSAL	£32/10/-
6 VALVE	£31/17/6	VALVE UNIVERSAL	£36/17/6
8 VALVE	£41/17/6		

Also the amazing new dry battery, Portable and Car Radio. 5 valve £27/17/6.

AMPLIFIERS

£12/19/6

240V A.C. only

7 Valve 10 watt	£12/19/6
7 Valve 25 watt	£22/17/6
7 Valve 40 watt	£29/17/6

240V AC HI-FI, PA Amplifier 7 Valve, 20 watt output, inputs for HI Microphone and crystal P.U. infinitely variable bass and treble boost 18 DB. Ideal for PA or Tape Recordings.

£26/17/6

Battery only

5 Valve 10 watt 6v	£15/17/6
7 Valve 12 watt 12v	£17/17/6
7 Valve 25 watt 12v	£22/17/6
12v Battery & 240v A.C.	
7 Valve 12 watt	£19/17/6
7 Valve 25 watt	£26/17/6

ACCESSORIES
MICROPHONES, SPEAKERS EQUIPMENT AT LOWEST GRAMO UNITS, RECORDING PRICES

internal resistance to protect the electrolytics in the event of the leakage current reaching a dangerous level. In this manner the rising leakage characteristic can be turned to good account by automatically reducing the voltage if it should tend to rise unduly.

In practice it would appear that there is only a slight rise in leakage current at 265 volts and it would therefore seem quite safe to allow the voltage to rise to 260 volts with prolonged charging, and our power supply has been designed on this assumption. There should also be sufficient resistance to protect the electrolytics in the event of higher voltages due to power line surges.

As the circuit shows, it is quite a simple arrangement, consisting of a power transformer, rectifier and bleed resistor. The power transformer is rated at 185 volts (RMS under load) with a continuous current rating of 50 mA. A 6.3 volt winding supplies the rectifier filament. These specifications have been passed on to several transformer manufacturers who should be able to supply suitable versions by the time this is published.

The rectifier happens to be a 6X4, though a 6V4 would also suit. In the "-GT" types a 6X5 would be suitable, provided the layout was changed to accommodate the larger physical size.

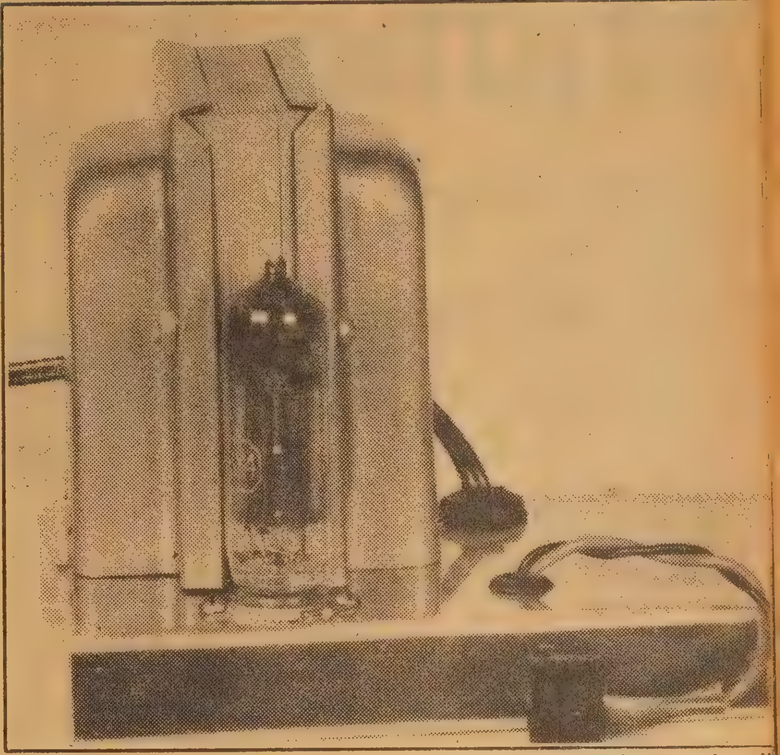
BLEED RESISTOR

The purpose of the bleed resistor is to limit the final voltages to which the capacitors will charge and it may need to be adjusted to suit individual components. In our case a value of .1 meg was correct. Although this bleed resistor reduces the final voltage it does not seriously increase the charging time, since its value is high, relative to the impedance of the capacitors, during the greater part of the charging cycle. It is only when the end of charge point is reached that the bleed becomes significant.

A two watt resistor is required and this is most conveniently provided by two .2 meg. 1 watt units in parallel. Two .05 meg. 1 watt types could also be used, but is usually more difficult to accommodate series connections than parallel ones.

Having evolved a suitable circuit, the next problem was to build it into a form which would enable it to be quickly substituted for a set of batteries, ideally without the need for any additional switching. This was complicated by the need to feed the power supply directly to the capacitors, while the battery circuit must retain the 250 ohm limiting resistor.

The scheme we finally chose is quite a simple one, and the details may be gathered from the circuit. A miniature four-pin plug is used to terminate three leads in the main unit, one being common (negative),



Complete power supply. Socket in front of chassis connects to plug in main unit

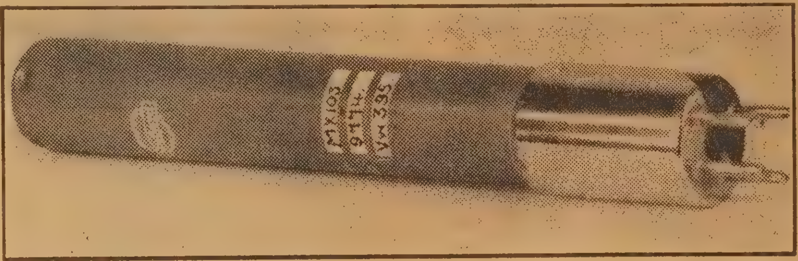
The gun-camera assembly in use. Note the bracket holding the cable release on the gun and the handle under the camera. Also visible is the scale around the focusing knob to translate the guide number to "f" values and the wing nut (under the camera) which is part of the non removable screw.

Mullard

GEIGER COUNTER TUBES

The range of Mullard Geiger Counter Tubes includes types for the detection of Gamma radiation and Alpha and Beta particles and photons down to very low energies. All types are halogen quenched having a long life, and operating over a wide temperature range.

Of special note is the MX103, a low voltage, all metal, self-quenched gamma counter suited for portable radiation detectors and which along with the other types was developed in collaboration with the Atomic Energy Research Establishment, Harwell.



The popularity of Radio and Hobbies Geiger Counter has been so great that our stocks of the M103 tube became exhausted long before we anticipated. Further supplies are arriving by sea and air, and in the meantime we regret any inconvenience which may have been caused by the delay.

Mullard

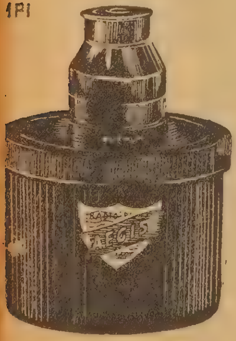
Mullard-Australia Pty. Ltd.

Head Office: 35-43 Clarence Street, Sydney. Tel. BX2006
Branch Office: 592 Bourke Street, Melbourne. Tel. MU2366
Associated with Mullard Ltd., London. Mullard Overseas Ltd.

FOR PERFECT RECEPTION!

ere are two Aegis developments that will mean clearer broadcast and short-ave reception for you. Your listening pleasures will be remarkably improved

FI



AEGIS ALL-WAVE NOISE REDUCING
AERIAL SYSTEM
AND THE AEGIS
MAINS FILTER

This splendid little line filter eliminates interferences from Lifts, Motors, Refrigerators, etc. coming through the electrical mains.
MFI retails at . . .
45/-

AFI

Completely dispels noise interference in both broadcast and shortwave. Contents: 2 specially matched Aegis Transformer units, incorp. fixed iron-cored B/C & S/W inductances & Faraday Electrostatic Screen for max. sig. transfer; 50ft. twin plastic-covered low impedance lead-in wire; 40ft. 7/22 copper aerial wire; egg insulators; complete instructions. All in attractive carton. The aerial is completely assembled—no additional soldered joints. Lead-in & earth wires attached to aerial transformer.

hese products are available from
egis retailers in all States.

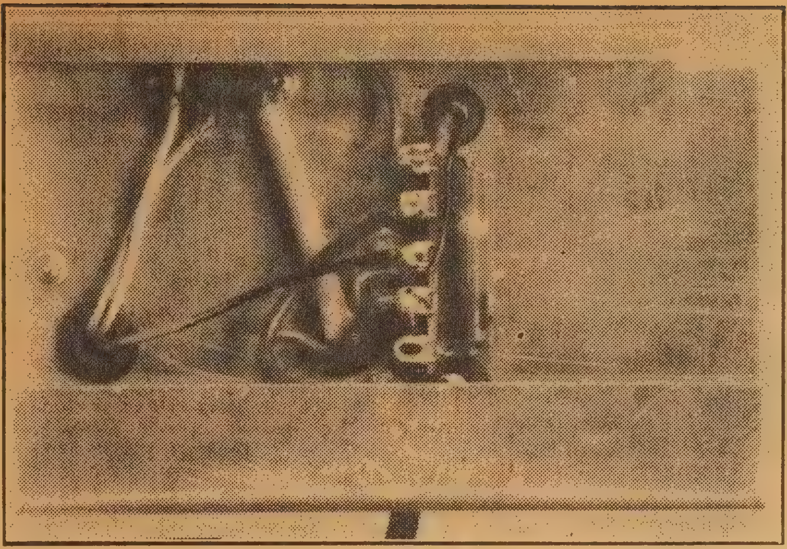
AFI
Retails at
134/6
complete

Also obtainable AF2
2 Matched Transformers, retailing at
78/- pr.

AEGIS

AEGIS MANUFACTURING CO PTY LTD

208 LITTLE LONSDALE ST., MELBOURNE, C.1. New 'Phone. FB3731



An underneath view of the AC power supply chassis. Apart from the wiring to the rectifier socket the only other components are the two .2 meg resistors forming the bleed and the five terminal tag strip to hold them and terminate the primary leads from the transformer.

one being positive, and connecting straight to the capacitor switching circuit, and one being positive and connecting to the battery limiting resistor.

On the power supply a suitable socket provides the outlet connection and is wired to pick up the two appropriate leads when fitted to the plug. Similarly, another socket is connected to the battery pack and is wired to connect the battery correctly when it is fitted.

When we came to fit the transformer it became apparent that there was no easy way to accommodate both the AC power supply and the fifth capacitor, which some may want to use.

We don't say it can't be done, but the layout would be unconventional, to say the least, and hardly suitable for the slip-in replacement type unit we had in mind. We decided, therefore, to describe the unit on the basis of being suitable for a four capacitor version, unless it was to be fitted permanently as an AC only version.

While on the subject of using five capacitors, it is as well to point out that the normal tolerance on electrolytics is minus 20 pc., plus 50 pc. This means that it would be possible, though unlikely, to use five capacitors all 50 pc above tolerance, which would therefore store 150 joules rather than 100. Add to this a somewhat higher operating voltage from the AC supply and the flash tube would be severely overrated. Even if this extreme condition is not reached, there is still the possibility of some overload and the 80 joule arrangement would appear to be adequate, and somewhat safer.

To support the power supply chassis, we fitted a small shelf immediately above the capacitors and on

PARTS LIST

1	aluminium case 8¼in by 5¼in by 4in.
4	650 mfd 250 volt electrolytic capacitors.
1	.5 mfd 350 volt paper capacitor.
1	.02 mfd 350 volt paper capacitor.
1	1 meg. ½W resistor.
1	.5 meg. ½W resistor.
1	.15 meg. ½W resistor.
1	.1 meg. ½W resistor (see text).
1	250 ohm 1W resistor.
1	150 ohm 1W resistor.
1	250V 100 joule flash tube, SF15 or similar.
1	miniature neon lamp.
2	490P batteries.
1	467 battery.
1	trigger transformer.
1	2 pole 3 position switch (series 20, type 28 or similar).
1	reflector.
	Approximately 9in 1⅜in OD 20g brass tube for gun.
1	single contact mic. plug and socket.
	4ft twin plastic flex.
1	grommet ¼in hole.
3	3 terminal tag strips.
1	4 terminal tag strip.
1	8 terminal tag strip.
2	plugs for 490P batteries.
2	fastener clips for 467 battery.
2	pieces of insulating bakelite approx. 3in by 4in.
1	pointer knob.
1	leather strap.
	Hook up wire, nuts and bolts, solder lugs, insulating sleeving, 18g tinned copper wire, &c.

ADDITIONAL PARTS FOR AC POWER PACK

1	Chassis 5½in by 4in by ¾in.
1	power transformer 185V per side at 50mA., 6.3V at 1A.
1	6X4 valve.
1	miniature 7 pin socket.
1	miniature 4 pin speaker plug.
2	miniature 4 pin speaker sockets (one for battery pack).
2	.2meg 1W resistors.
1	5 terminal tag strip.
1	3 pin power plug.
4	rubber grommets.
	Power cord (as required).
	Hook up wire, spaghetti sleeving, nuts and bolts, &c.

AMPLASOUND CO.

AUDIO EQUIPMENT SPECIALISTS

Amplifiers

all makes 5 to 60 watts HI, FI, Williamson Amplifiers with tone control.

Microphones

RONNETTE crystal microphones, mic. inserts and pick up's.
HODGES crystal microphones.
HODGES microphone desk stands.
RESLO ribbon microphones.

Record Players

GARRARD, COLLARO & DUAL 45 R.P.M. Record Adaptors,

Speakers & Enclosures

GOODMAN AND ROLA
360 degree Circular Flares.
8in Cream Speaker Cabinets.

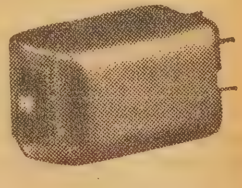
Tape Recorders

PYROX, NOVATAPE.
TAPEX Magnetic Tape Joining Fluid.

P.M.F. MAGNETIC

FILM

HEADS



Suitable for 16, 9.5 and 8mm film soundtracks, Mumetal shield fitted (Vital for film work), small size 1in by 6/10in by 6/10in. Excellent frequency response. High Output. Record Play and Erase Heads ex. Stock.

Send your films to us for PYRAL magnetic striping process. Sample and technical information on application. (Please add postage.)

Pyral Magnetic Tape

Plastic Base 7in.	£3/10/-
Paper Base 7in.	£2/5/-
Plastic Base 5in.	£2/2/-
Paper Base 5in.	£1/9/6

Telephone Amp. Coil Kit

Comprising
500 ohm. Coils. 5—Strips of high grade Stalloy cut to size.
Price only 10/- incl. Postage.

Technical information gladly supplied.

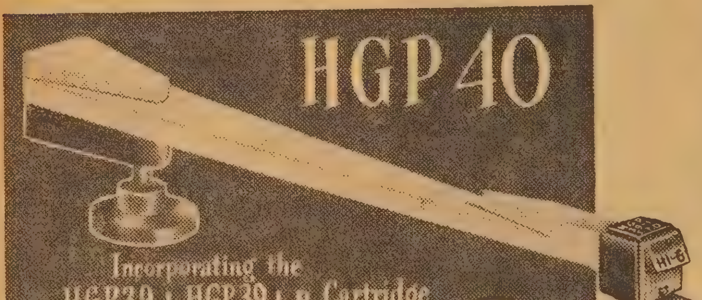
Country and Interstate Clients catered for.

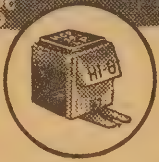
Write or Phone

AMPLASOUND CO.

126 Buckingham Street,
Sydney. Phone MX3124

A New Superb ACOS CRYSTAL PICK-UP





IT'S TOPS!

IT'S NEW!
IT'S HERE!

The HGP 39 cartridges will also fit the GP 20 arm.

HGP40 Pick Up	£9/15/-
HGP39 Std. Cartridge ..	£3/12/6
HGP39LP Cartridge	£3/12/6

The outstanding features of this pick-up are:—

High compliance, low element mass.

Completely hermetically sealed crystal unit.

High output.

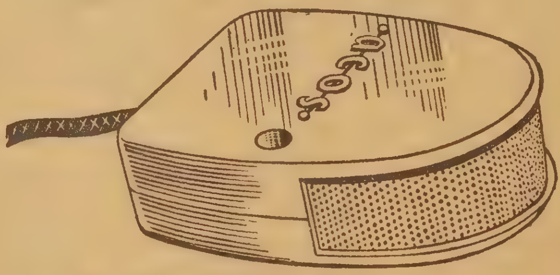
Low stylus pressure, with the minimum of record wear.

Interchangeable pick-up heads with replaceable sapphire styli.

SPECIFICATION

Response	flat from 40 cps to 13 Kcs.
Overall response	20cps to 17 Kcs.
Output	1 volt on standard records, 1/3 volt on microgroove records
Tracking Weight	8 grammes

Australian Agents: AMPLION (A'sia) PTY. LTD., Sydney, N.S.W.



A NEW SENSATIONAL CRYSTAL MICROPHONE!

ACOS MIC 35 (HAND AND/OR DESK TYPE)

AT THE AMAZING PRICE OF

£2/15/0

A general purpose microphone with high sensitivity and substantially flat characteristic. Housed in attractive Die Cast Case of very robust construction is particularly suitable for use in recording apparatus — Public Address Equipment — Dance Bands — and similar applications.

Provided with built-in shunt resistance of 2 megohm giving response substantially flat from 50/5,000 cps. Resistance of the input circuit will reduce the low frequency response. A grid leak of ½ megohm will reduce the output at 500 cps by 3 dbs and pro rata at lower frequencies.

Approximate capacitance of the microphone is 750pF and cable capacitance will reduce output proportionately.

Frequency response	Substantially flat from 50/5,000 cps.
Output level	= 55 db ref. 1 volt/dyne/cm2.
Load resistance	2 megohms included.
Cable	This microphone is supplied with approximately 4ft. (1.2 metres of co-axial cable (type Unirad 32).
Weight	Microphone only — 6oz. (approx. 170 grammes) complete with packing 7oz. (approx. 198 grammes).
Dimensions	Microphone only 2 7/8in x 2 1/8in x 7/8in plus cable. Complete with packing 3 3/8in x 2½in x 2¼in.

Australian Agents: AMPLION (A'sia) PTY. LTD. Sydney, N.S.W.

which the batteries can also rest. This is held in place by four countersunk screws, two on each side of the case. An opening is provided in the rear left-hand coner of the shelf to clear the cables running from the capacitors to the switch.

The chassis proper is as long as the case is wide, and deep enough to prevent excessive movement after the lid is fitted. It must be shallow enough to clear the tag strips which normally hold the 67.5 volt battery in place and the sides are turned under to ensure that it rests firmly on the shelf. A blueprint showing the additional mounting holes for the shelf, as well as the chassis dimensions, is being prepared, and will be available to chassis manufacturers or individual readers.

The wiring of the power supply is quite simple and the only comment concerns the use of a five terminal tag strip, to terminate the power cord and support the bleed resistors.

Due to the shallow chassis, it is not possible to accommodate this strip in the normal way and a little "doctoring" is necessary. First, the centre leg is straightened at the normal bend and then bent again at right angles, as close as possible to the rivet. Then the upper extremities of the terminals are bent over at right angles to provide a safety clearance.

SOCKET CONTACTS

The sockets used to terminate the power supply and battery leads should have the unused contacts removed, otherwise there is a possibility of receiving a shock from the capacitors when changing units. The contacts which are used should be adequately insulated by means of spaghetti sleeving, both to protect the operator and to prevent damage to components due to short circuits.

In any case, care should be exercised when changing units, not to come in contact with the plug pins, if there is any chance that the capacitors may be charged. It is as well to remember that even after they have been discharged, there is still some charge remaining, about 50 volts, while it may be even higher if the power has been turned off before firing the flash.

We deliberately designed the power supply layout so that one-half of the chassis was clear of components, this space being intended to house the power cable. The amount which can be accommodated depends on the type used and the best in this regard is ordinary twin plastic.

However, this has the disadvantage that it does not provide an earth connection for the frame of the equipment and many may prefer to use the lightest available three-core flex.

To bring the cord through the case we cut a slot in the edge of the lid, which is large enough to allow free passage of the cord. This permits the cord to be pushed into the case after use and be withdrawn quickly when required. Using twin plastic, we were able to push about five yards of cord into the case, and this would seem to be enough to suit most situations, though it would be wise to provide an additional length in the form of an extension cord.

SIMPLE TO USE

To use the unit it is only necessary to connect it to the mains, allow time for the rectifier to warm up, then select either the "HIGH" or "LOW" switch position, as required. Charging time to 240 volts is about nine or ten seconds, after which the voltage will rise very slowly to about 260 volts. Weight, complete with five yards of flex, is 6¾lb.

This completes the details of the power supply and we may now consider some constructional features of the gun, which we were unable to cover last month.

One point which we mentioned briefly was the placing of the flash tube relative to the reflector to give an even distribution of light. At the time it appeared that the tube was too close to the reflector and we suggested that it would have to be moved further forward.

However, more careful investigation and some simple tests showed that the opposite was the case and that it needed to be closer to the particular reflector which we used. The best setting which we have found to date is one where the front of the lamp (excluding the exhaust tip), is 1 5-16in from the reflector.

This position may call for some small alteration to the method of holding the lamp and particular care should be taken to see that the grub screw used to hold the metal base is not so located that it will screw into the glass or the top of the metal base which has glass beneath it.

Regardless of the type of camera employed the gun will need to be fitted with a bracket of some kind to enable it to be attached quickly and easily to the camera. Naturally the design will vary with the type of camera involved, but a few words about the bracket we made should serve as a useful guide.

TYPICAL BRACKET

The bracket was intended to suit a Rolleicord camera and the same design would be very suitable for many other types. It was made from a length of brass strip 1-8in thick, ½in wide, and 8in long. This was bent at right angles at a point 2in from one end, this short section being to attach to the side of the gun.

In bending brass of this thickness it is very easy to break it and, ideally, it should be heated before bending. However, we managed to do the job cold by making a well-rounded bend, altering the position

(Continued on Page 107.)

AWA RONETTE

MICROPHONES & ACCESSORIES

TYPE 088/1

£14-15-6

Technical pamphlets [illegible] be mailed [illegible] request.

Other types also available from

NICHOLSONS LTD.
BARRACK ST., PERTH
and leading wholesaler

FERRIS Electric TRAIN

RECONDITIONED EQUIPMENT

at

Greatly Reduced Price

☆

This equipment is "as new having been used only for window display purposes. Bu now and add valuable units t your lay-out at bargain price Each is made to the Ferri standards of fine engineerin and sturdiness.

6 only F52 Locomotives with Tender (N.S.W.G.R. C36 model) with efficient smooth running motors, **£8/10/ each.**

10 only F50 Electric Power Cars fo Suburban electric models, **£4/16/ each.**

8 only Transformer control unit **£4/5/- each.**

24 only F48 Trailer Cars for suburban electric models .. **£1/4/- eac**

18 only Express Cars .. **£1/4/- eac**

Assorted Trucks, **10/- to 19/6 eac**

Assorted rails, straights & curve **£1/5/6 doz.**

Crossovers .. .. **12/6 eac**

Manually operated points, **£1/5/ pair.**

Cut coupon and send for ful details and price list of Ferri Electric Trains.

To FERRIS BROS. PTY. LTD.,
252 Dowling Street, East Sydney.

Please send me illustrated brochure and price list of all equipment available.

NAME ....

ADDRESS ....

....

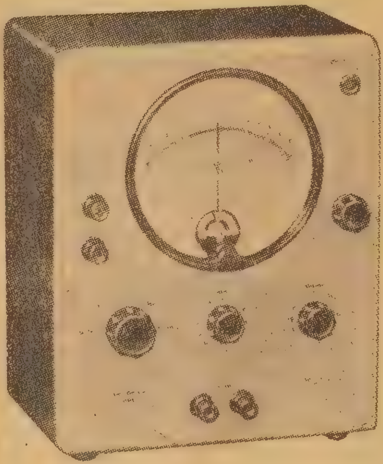
R & H 5/54.

BRÜEL & KJÆR

Electrical engineers

OF COPENHAGEN, DENMARK

Apparatus for Teletechnical and Acoustical Research



INSTRUMENTS FOR COMPONENT TESTING

DEVIATION TEST BRIDGE
Type 1502 and 1507

has been designed for use primarily in the production inspection of resistors, capacitors, and inductors. Operationally, the percentage of deviation of the component to be tested from a standard component is read on a large illuminated scale. The scale itself has two ranges. The indicating meter is of the moving coil type and is equipped with a specially constructed pointer to aid in reading. The Deviation Test Bridges have a very high indicating speed, making it possible to test as many as 4,000 resistors or 2,000 transformers per hour. The range calibration and the zero adjustment are readily performed by means of a built-in standard. The stability of these units is very high and readjustment of the standard controls is generally necessary only once a day.

SPECIFICATIONS

MEASURING OBJECTS FOR DEVIATION MEASUREMENTS	TYPE 1502	TYPE 1507
Resistance	10 Ω-10 MΩ	20 Ω-100 kΩ
Capacitance	50 pF-10 μF	25 pF-0.1 μF
Inductance	2 mH-100 H	100 μH-0.3H
MEASURING OBJECTS FOR DIRECT READING WITH EXTERNAL STANDARDS		
Resistance range from ..	0-0.7 Ω to 0-3.3 MΩ	
Capacitance ranges from .	0-7 pF to 0-3.3 μF	0-7 pF to 33 μF
Measurement Frequency .	1000 c/s	50 kc/s

INSTRUMENT: Large moving-coil instrument and illuminated scale with zero point in the centre. The instrument is safeguarded against overloads. Full scale deflection from — 7% to + 8% on one range, and — 25% to + 35% on the other range.

COMPARISON ACCURACY: Better than 0.1% at zero point.

TOLERANCE ACCURACY: Better than 5% at full scale deflection.

SPEED OF OPERATION: Normal production test is 4,000 resistors or capacitors per hour.

STABILITY: The zero point is independent of the line voltage.

AC-HUM: The bridge is not sensitive to hum voltages.

TUBES: 3x6AU6, 6AQ5, 6X4, OA2, and in Type 1507 also 6AL5.

POWER SUPPLY: 115, 127, 150, 220 volts a.c. 40-120 c/s. 40 watts.

DIMENSIONS: 33 (height) x 28 (width) x 20 (depth excl. dials) centimeters.

13 (height) x 11 (width) x 20 (depth excl. dials) inches.

WEIGHT: 9 kg or 20 lbs.

Sole Australian Distributors:

NATIONAL INSTRUMENT CO. PTY. LTD.

Head Office and Works: Aerodrome, Essendon, Vic. Phone FX 1571

SALES OFFICE: 134 Ferrars St., Sth. Melb. - Phone MX 1107

NC11

Branches at:

ADELAIDE: Airways House, 132 North Terrace - - LA 0461

PERTH: Aerodrome, South Guildford - - - - - - ML 453

SYDNEY: Airways House, cr. Clarence & Margaret Sts. - BO 229

BRISBANE: Compo Road, Rocklea East - - - - - JW 2437

HOW TO LINE UP YOUR RECEIVER

The best made racing car in the world won't perform if its valve adjustments, ignition timing and all the other necessary critical settings are not accurate. Neither can you expect to get the best out of a superhet receiver unless all the tuned circuits are correctly aligned. This article applies in particular to the 5-valve receiver described last month but only minor modifications to the sense are required to cover most modern receivers.

IN a factory, receivers are aligned with the aid of a signal generator and an output meter. If you have such instruments available, there is no doubt that the best job can be done in the shortest time with their aid. However, if you have the instruments or access to them, it is unlikely that you will be lacking advice in their use.

The chances are that you do not have a signal generator and output meter and that you could borrow them only at considerable inconvenience. Well then, this article is for you!

If you are prepared to take a little trouble, an excellent job can be done using broadcast signals in place of the signal generator and using your ears in place of an output meter as a judge of variations in volume.

LINING BY EAR

It takes a little longer and the final result may be a few points down on the instrument job but the few extra minutes are not likely to be of any consequence and the receiver has a reserve of performance so that it will do a good job even if it is a little out.

We have proved the point in our own laboratory. First of all the receiver was aligned as accurately as possible with instruments and readings of sensitivity taken with the signal generator and output meter. Then, so that there was no possibility of cheating, the receiver was deliberately misaligned by another member of the staff after which it was lined up in the manner which we are about to describe.

A second set of sensitivity readings was taken with the aid of the instruments so that the sensitivities on instrument alignment and manual alignment could be compared.

We were agreeably surprised. Without the aid of instruments, the difference may not have been detected. Possibly we were just plain lucky but it does prove that you should not sidestep superhets because you do not have a set of instruments to get them going.

PRELIMINARIES

If the alignment is to proceed smoothly there are a few preliminaries to be considered. First of all the relative positions of the tuning capacitor and the dial pointer must be adjusted.

We've noticed a move for the better in the case of some of the latest dials where the pointer position with the capacitor plates fully in is marked. It is then simply a matter of tightening the locking screw on the dial drum with the capacitor and pointer in the correct positions.

If it is not marked, you can arrive at the correct position as follows: Measure the distance between the 550 Kc calibration point and the 600 Kc point. Divide the distance by two and set the pointer on the low frequency side of the 550 Kc calibration point by this amount. Lock the dial drum with the capacitor plates fully in. The lower limit of the band will thus be about 535 Kc.

As we said last month, if the mechanism will not rotate the capacitor through the full 180 degrees without straining the cord at one of the extremes of the range, it may be necessary to do some adjustment. You can arrive at the correct result by altering the position of the pointer on the dial cord.

The tension of the dial cord is important for smooth operation. If it is too loose the cord will slip on the control shaft, and if too tight it will be hard to turn and you will not get full benefit from the flywheel action of the dial in running from one end of the band to the other.

In general it is necessary to have the dial cord twisted twice around the control shaft to prevent slip while at the same time keeping the tension down to a reasonable amount.

EIGHT ADJUSTMENTS

Altogether, there are eight adjustments of the tuned circuits provided, and in order to achieve the desired results you must adopt a definite procedure.

The variable iron-dust cores in the coils, one each in the aerial and oscillator coils and two each in the IF transformers, are adjusted during final inspection at the factory. However, the adjustments are bound to be upset by the addition of the various components in the receiver. **There is some point in recording the original position of the slugs, just in case something goes wrong and you wish to go right back to the start.**

As they come to you, the trimmer capacitors will not have any particular setting. It is a good idea to adjust the outer plate so that minimum capacity is achieved with some tension still between the plate and the adjusting screw, in case the set happens to line up in this position. You will, of course, have made sure that the trimmer plate which touches the adjusting screw is solered to the frame of the gang.

IRON-DUST CORES

An ordinary screwdriver is quite in order for adjusting the trimmers, but, in the case of the iron-dust cores, the presence of the screwdriver may have some effect on the setting, so that the correct setting with the screwdriver in place may not be the correct setting when it is removed. This is particularly so in the case of coils which employ ir dust cores with the screwdriver sl cut in the core itself.

Special aligning tools which en ploy a small metal tip on the er of a shaft of insulating rod are avai able. Ordinarily, the amount metal involved is so small that does not make any appreciable di ference to the tuning.

Alternatively, a screwdriver poi can be sharpened on the end of piece of fibre rod. Failing fibre ro a narrow strip cut from a piece sheet bakelite can be used as ra material.

MAKING A START

Go over all the adjustments wit the aligning tool before you switc the set on to make sure that they a operate smoothly because it is ver annoying to have to leave off in th middle of the alignment to make mechanical adjustment.

Connect the set up to an aerial an earth, preferably the ones wit which it is to be used, connect th speaker and switch the power o Tuning across the band, you wi probably be able to hear quite a fe stations. Try to find a weak bu steady station near the low fre quency of the band. There is som advantage in doing the job in day light, because the weak stations ar more likely to be steady than a night.

Tune the receiver as accuratel as possible to the station yo choose. The best way to do this, o in fact to make any of the adjust ments about to be described, is t rock the setting backwards and for wards over the correct point grad ually converging on it.

USE OF WEAK STATIONS

You can now adjust the four II transformer cores for maximum out put from the speaker.

It is possible that what was previously a weak signal now become a strong signal as the sensitivity o the receiver rises. This being the case, do the best you can on the original station, and then tune accurately to a weaker station and g over the procedure again.

There is a special reason fo choosing a weak station. The receiver incorporates an automatic volume control system, which tends to keep the output from the tune section of the receiver constant, even though the signal varies in strength over wide limits. The circuits of the receiver are such that the system does not work on very weak signals, and therefore the full sensitivity of the receiver is available when required.

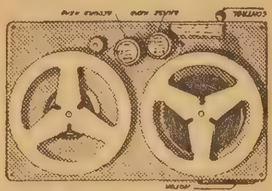
If strong signals are used for alignment purposes, the automatic

Homecrafts PTY. LTD.

LARGEST STOCKS, GREATEST BARGAINS

MAKE YOUR OWN RECORDINGS

L.B. TAPE DECK



- ★ Weight 7½lbs
- ★ High fidelity 50 to 9000 c.p.s.
- ★ One hour playing for each spool
- ★ Self-contained motor
- ★ Electronic erase head fitted
- ★ Built-in vernier control
- ★ Fast forward and re-wind

PRICE COMPLETE £40

Plus 12½% Sales Tax

Above Tape Deck

L.B. Tape Deck, complete with Oscillator, Pre-amp and power supply.

£59/10/-

Or Complete in Carrying Case ready to connect to Radio Set.

£67/10/-

Q PLUS EXTENSION SPEAKERS

57/6

TAPE BARGAIN

3600 foot Reels. Imported Plastic Tape.

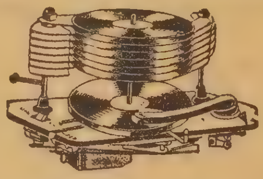
£8/8/-

Complete with 3 empty 7in Spools.

Lumolite

Neon Indicators **9/10**

240V AC/DC or 70V for level indicators, etc.



BARGAIN RECORD CHANGER

IMPORTED SWISS "PAILLARD"

A masterpiece in Record Changers, featuring variable speed, Crystal Pick-up, etc. Brand new.

Paillard Changer £8/19/6

CAPITOL 4-WATT AMPLIFIERS

Suitable for use with Pick-up or Crystal Microphone. High quality reproduction of both Std. and Lp. Records.

£12/10/-

METER BARGAINS

0-20V	14/11
0-40V	14/11
0-2.5 RF amps	7/11
0-3 RF amps	7/11
30-0-30 amps DC	35/-

BAKELITE CABINETS

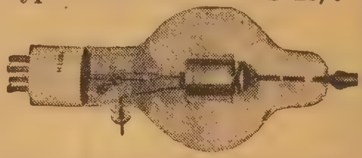
Suitable for Small mantel Radio from 4/11

TRANSMITTING TUBES

Famous Eimac Tubes

Type 35T 39/6

Type RX21 and KY21 28/6



Country Customers Please Add Postage

STOP PRESS BARGAINS

12 volt 500 Watt Generators	79/6
Goldring 150 Pick-ups	39/6
8 Mfd. 525 Volt Electrolytic Cond.	2/6
300 Mfd. 12 volt Electrolytic Cond.	1/6
Crystal Detectors Cup and Arm Type	1/-
Leatherette Portable Cabinets	2/11
Tru-Trac Pick-ups	4/11
Radiogram Cabinet and Record Changer, 3-speed. THE LOT	26gns.

VALVES

6K7 Metal	7/11
6H6 ”	7/11
6A6 ”	7/11
76 ”	7/11
A630 ”	2/11
EF50 ”	7/11
6SH7 ”	7/11

ALUMINIUM RADIO CHASSIS

6in x 4in	5/10
8in x 5in	7/11
10in x 6in	9/4
11in x 8in	11/5
13in x 7in	11/5
13in x 10in	14/-
17in x 8in	17/6
17in x 10in	19/3
17in x 12in	21/6

WRITE OR CALL FOR FREE COLOR RESISTOR CHART

290 LONSDALE STREET, MELBOURNE FB3711

volume control tends to mask the adjustment, making the correct setting difficult to find.

When you have finished with the IF transformers they should be fairly close to the specified 455 Kc. Even if they happen to end up 10 Kc or so off the specified frequency it will not be serious. The main thing is that they are all accurately aligned to the one frequency.

At this point we will digress a moment to introduce another subject. The intermediate frequency amplifier of the receiver, consisting of the 6N8 valve and the IF transformers provides a substantial portion of the total amplification of the receiver.

Changes in layout, wrong components or long leads may allow some of the energy from the output of the amplifier to be fed back into the input. This may build up in strength until the amplifier eventually generates a signal on its own account. in other words it will "oscillate".

This signal with heterodyne or "beat" with the signal being received by the aerial will cause a whistle in the output.

An oscillation whistle will appear on all stations and will vary as the tuning is varied, although it may disappear as the set is tuned accurately to a strong station, because the gain of the IF amplifier is reduced by the AVC.

OSCILLATION

The important thing is to realise what has happened if the IF amplifier does happen to oscillate and then to set about finding out how your wiring differs from the original. If you strike trouble there is no point in going on with the alignment until the fault is found.

Fortunately, the chances are that everything will go smoothly right through the whole procedure. A couple of odd whistles on stations near the centre of the band only can be ignored. They will tend to be less obvious once the alignment is complete.

Having satisfactorily completed the alignment of the IF amplifier it remains to adjust the aerial and oscillator circuits.

Tune to a station which you can easily identify toward the high frequency end of the band and adjust the trimmer on oscillator section of the gang until the station coincides with its position as marked on the dial.

Then tune in a station toward the low frequency end of the band, and by means of the core of the oscillator coil bring it to its correct position on the dial.

Repeat the above adjustments a couple of times because it is possible that one adjustment will have an effect on the other.

STATION ALIGNMENT

Provided the dial and the tuning gang are correctly matched, all the stations should now coincide with their marked positions on the dial.

Should the AVC system tend to make the strong local stations appear broad it would be in order to remove the aerial or operate the set with a short length of wire while making these adjustments to the station position.

Finally, the aerial trimmer and the core of the oscillator coil have to be adjusted to obtain the strongest signals. The trimmer adjustment should be made toward the high frequency end of the band and the core adjustment toward the low frequency end.

The aerial circuit should be adjusted with the aerial with which the receiver is to be used connected and it is a good idea to go over it several times to make sure that you get the best results.

By this time the set will be very sensitive indeed, and you may not be able to find exactly the sort of signal you require. In this case it is quite in order to tune the set off a station and adjust for the greatest noise output.

SIMPLE PROCEDURE

The above procedure is somewhat simpler than we have described in the past, due to the use of a precision fixed padder and the availability of adjustable cores on both aerial and oscillator coils.

Some readers may be concerned as to the best position in which to set the volume control while making the adjustments. The control has no effect on any of the settings. However, you may find that it is possible to get a more easily recognisable change at some volumes than others.

It is not a good idea to turn the volume too low, because the effect of the adjustment may be difficult to appreciate in the presence of other sounds. On the other hand, there is no need to set the control so that everyone for a mile around is aware that you are doing some radio work.

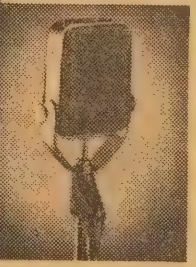
Carefully carry out the procedure we have described and there is every chance that your set will perform as well as any comparable five-valve set you can buy or build.

COW'S milk and human milk have equivalent caloric values, but cow's milk contains more protein and minerals.

BOAT BUILDING BOOKS FOR THE HANDYMAN

Motor Boat Plans and Designs Vol. VIII £2/0/3
Modern Motor Boat Building. Vol. XI £2/0/3
30 Easy to Build Sail Boats. Vol. XV £2/0/3
Selected Popular Motor Boats. Vol. XVI £2/0/3
Motor Boat Building. Vol. XVII. £2/0/3
Complete Designs for 44 Modern Boats. Vol. XVIII £2/0/3
40 Designs for Post War Boats. Vol. XX £2/0/3
Runabout Book. Vol. XXII .. £2/0/3
Up-to-data Designs for Motor & Sail Craft. Vol. XXIII £2/6/0
Complete Plans for Plywood Boats. Vol. XXIV £2/6/0
Small Boats for Outboard Engines. Vol. XXV £2/6/0
All the above mentioned Books are plus 2/- Registered Postage.
Write for full particulars to:—The Exclusive Representatives for Australia and New Zealand.
Associated Trade Journals Coy. Pty. Ltd.,
N.Z.L. House, 42 Bridge St., Sydney, N.S.W. Phone BW1400.

At Last—
A COMPLETE HIGH QUALITY AMPLIFIER AT A LOW PRICE
Unit Playmaster
Fully described in
RADIO & HOBBIES FOR JANUARY.
It is a complete amplifier incorporating bass and treble compensation controls.
A complete kit for this high quality amplifier, less speaker, is available for—
£19/15/-
Or you may purchase it completely assembled and tested, with a 12in speaker for £31/5/-
Call and hear our demonstration model.
PRICE'S RADIO
5-6 ANGEL PLACE
SYDNEY

AWA RONETTE
MICROPHONES & ACCESSORIES

Type RFC5
£14-19-2
(High impedance)
Type RFC/L
£19-0-0
(Low impedance, 200 ohms.)
Technical pamphlets will be mailed on request.
Other types also available from
NEWTON McLAREN
17 LEIGH ST., ADELAIDE
and leading wholesalers.

EXTRA MONEY AHEAD
Learn how easy it is to make REAL MONEY for yourself. Men or women can operate sure-fire Money-Making Plans. No kits or Courses to buy.
Free details from J. O'Rourke Director, Dept. RH, Profitable Enterprises, Box 5070 G.P.O., Sydney.

Pocket Book
STORYTELLER WEEKLY HAS THE PICK OF THE WORLD'S BEST STORIES

A COURSE IN TELEVISION

PART 49—THE NTSC COLOR SYSTEM

Just recently the US Federal Communications Commission authorised television stations to radiate commercial color programs, based on transmission standards similar to those suggested by the National Television Standards Committee. This and succeeding articles will explain the so-called NTSC system and bring readers up-to-date with color television progress.

THE background and techniques of color television, applicable at he time, were examined at some ngth in the issues of this maga-ne from June to October 1952.

Of the five articles, the first two ealt with the fundamentals of color hysics — with wavelength, with rimary, secondary and complementary colors, additive and subractive mixing, saturation and ther such topics.

The next two instalments were devoted to a description of actual sysems of color TV presentation and, in particular, with the non-compatible mechanical system sponsored by Columbia (CBS) and the compatible electronic system sponsored by RCA. Instalment 5 had to do with tricolor picture tubes.

FURTHER DEVELOPMENTS

The events which have transpired since the publication of those articles are fairly well known.

The CBS mechanical system was provisionally accepted by the FCC — the governing body on radio matters in the US — and a limited number of color programs were broadcast by Columbia stations.

In selecting the mechanical system, the FCC was presumably motivated by a desire to reach some kind of finality and also by a serious doubt as to whether a satisfactory all-electronic, compatible system could ever be developed for commercial use.

By and large, the US trade thought differently and so effectively opposed the CBS approach that the FCC was ultimately forced to reconsider its decision.

The US radio trade set up a special committee to press on with the investigation of electronic, compatible systems based largely on the preliminary work done by RCA.

The principle on which the committee worked was that color television could only be introduced successfully and smoothly if the programs could be viewed simultaneously on conventional monochrome receivers.

The technical achievements of those concerned with the committee were of such an order that it was able very soon to make firm recommendations about standards and techniques and to give convincing demonstrations before the FCC of programs reproduceable either in full color or in monochrome.

In the face of this, the FCC was more or less forced to reverse its earlier decision and to authorise commercial standards to operate on standards based largely on the NTSC recommendations.

Some of the leading stations in the US have already installed color equipment and are radiating a limited number of color programs.

VERY SUCCESSFUL

Color receivers are, for the most part, still in the hands of trade executives only, but reports as to definition and color rendition are highly enthusiastic.

When the problem of color television was first considered, it was broadly assumed that the portrayal of a scene in three distinct primary colors would involve three times the amount of picture information required by a monochrome version of the same scene.

Assuming that there would be no sacrifice in picture detail, this would therefore involve a triple increase in bandwidth of the radiated signa The possibility of compressing th required information into the 6M channel used for monochrome signal was therefore judged to be remote.

However, during their experiment with compatible color systems, RC engineers in particular demonstrate that this assumption was not entirely valid.

They showed that the human ey was sensitive to abrupt changes i brightness but not to abrupt change in color. Greatly simplified, the showed that an entirely satisfactor color image could be built up b superimposing a "brightness" pattern over one that was little mor than a series of color patches.

BRIGHTNESS IMAGE

Taking advantage of this characteristic, a color television signal could be built up by superimposing a sharp "brightness" image — essentially a monochrome picture — over low definition color areas.

Since the low definition color areas contain little detail in themselves, they need involve only a limited amount of additional bandwidth.

By taking advantage of this important factor and using other tricks to conserve bandwidth, RCA engineers managed to cram all the required picture information into the standard 6Mc. picture channel, while retaining intact the usual line and frame synchronising pulses. Other pulses to do with color synchronisation were fitted into "vacant" spots in the standardised signal.

Their color receivers managed to combine all the relevant information into a color image, while monochrome receivers simply ignored the color information and operated as normal on the "brightness" information. Thus complete compatibility was achieved.

SIMILAR BASIS

The system envisaged by the present standards, based on NTS recommendations, makes use of th same general ideas but differs in detail from the original RCA practic

The system is, in fact, highly complex and it is not possible, in a article of this nature, to do anything more than convey to the reader a very rough picture of how the system operates.

By way of preamble it is necessary to recall that, when the human eye sees a color, it perceives three things —hue, brightness and saturation.

Hue is the shade by which we identify the color. For most practical

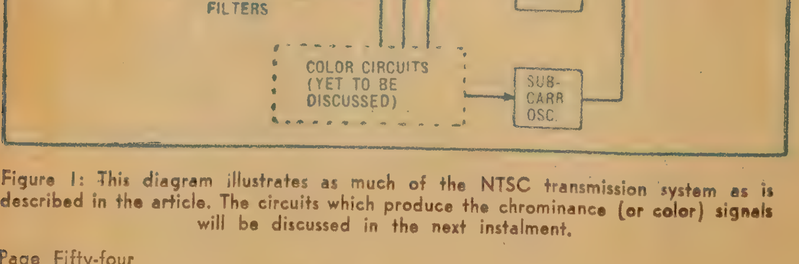


Figure 1: This diagram illustrates as much of the NTSC transmission system as is described in the article. The circuits which produce the chrominance (or color) signals will be discussed in the next instalment.

purposes the full range of shades or hues which the eye can perceive can be similated by combining in varying proportions the three primary colors. For television work, these are red, green and blue. (See earlier issues, as mentioned.)

Brightness is simply the intensity of the stimulus received by the eye from the particular color area.

Saturation defines the degree to which the color is diluted by "white light". A rich tone is saturated; conversely, a pastel shade is desaturated or, in other words, heavily diluted.

"White" light contains energy from all portions of the spectrum and in such proportions that the eye is conscious of brightness without any particular hue.

COLOR SEPARATION

The principles envisaged by the NTSC standards may be understood by examination of figure 1.

The original scene is collected by a single lens and the light rays passed through a series of dichroic mirrors, which separate the red, green and blue versions of that scene. If necessary, additional filters can be used after the mirrors to give the precise color response required of each channel.

The red, green and blue images are then focused on to the screens of three separate picture tubes and scanned in the usual way by synchronised electron beams.

The output signal from each picture tube, which is proportional to the brightness of the three images, is then split into two channels for subsequent use.

One output lead from each picture tube circuit is run to an electronic adder, which is equivalent in function to an audio mixing circuit. Here the three signals are combined into one and, since this composite signal contains information as to the brightness of all three primary colors, it may be regarded as a simple brightness signal.

When further combined with standardised frame and line pulse the signal can be utilised by monochrome receivers to produce a black and white picture. The fact that the original scene has been analysed in color at one stage in the process is of no practical consequence.

One point is worthy of special note at this stage, in respect to synchronising pulses. In an ordinary monochrome TV transmitter, it is customary to lock the frame pulses to the local power supply frequency, which is subject to short-term variations of up to perhaps 0.5 pc.

CLOSER CONTROL

In a color transmission system it is not possible to tolerate such wide and random excursions and it becomes essential to hold both the frame and the line pulse frequency to a very precise figure. The reasons for this will become apparent later.

Then again, there is a good deal of tolerance in the white and black reference levels of monochrome signals. In a color system, these regions must be kept under much closer control and the color standards therefore specify narrower tolerance limits.

These problems concern mainly the transmission engineer, who must design and maintain equipment to meet the specifications. Receivers lock in to the signals more or less as a matter of course.

Having established a "brightness" signal, which is the sole picture requirement of a monochrome receiver, the next problem is to extract from the picture tube outputs the necessary information about the color content of the scene and combine it into a signal which is capable of being satisfactorily transmitted and subsequently decoded by the receiver.

The vehicle which carries the color information is a high-frequency signal which is modulated on to the picture carrier along with the usual brightness and synchronising information. The character of this high-frequency signal varies in accordance with the color content of the picture.

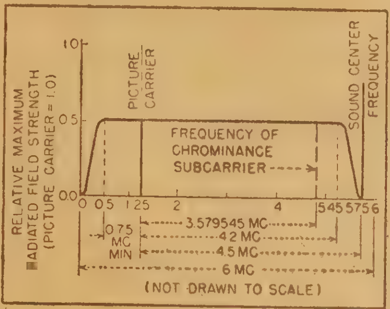


Figure 2: An idealised graph of a TV color transmitter characteristic, showing the position of the color sub-carrier in relation to the sound and picture carriers.

This so-called "sub-carrier" has a frequency of approximately 3.58 Mc, so that it produces dominant sidebands displaced either side of the picture carrier by this same figure. (In other words F-f and F plus f.)

Since all US stations use vestigial sideband transmission, the lower frequency sideband is suppressed as a matter of course and the predominant color sub-carrier is therefore located at a frequency 3.58 Mc above the picture carrier.

Obviously, in this position, the color signal is within the normal ambit of the picture signal sidebands, which extend with modulation to more than 4Mc above the picture carrier.

MIXTURE OF SIGNALS?

Assuming that the color sub-carrier will itself be subject to modulation — an aspect yet to be discussed — it seems obvious that there will be some intermodulation and admixture of the original brightness information with the color information.

This could be expected to produce unsatisfactory results in a color receiver and possible interference patterns in a monochrome receiver.

Two circumstances combine to reduce this hazard markedly. The first is the simple one that the response of most receivers is tapering rapidly in the 3.58 Mc region, so that the full effects of sidebands in this region are not apparent on the screen.

The second and more important point arises from a study of the sideband power distribution in a vision signal.

It has been demonstrated tha sideband energy tends to co trate in regions which repr harmonics of the line scan frequ In other words, the frequency s rum of a TV transmitter is occ by clusters of sidebands with s in between, rather than by e distributed sidebands.

Much the same is true of colo formation and the NTSC sy makes good use of this fact. choosing very carefully the quency for the sub-carrier, it is sible to arrange matters so that clusters of sideband energy from color signals fall between the cl ers of sideband energy from original brightness signal.

FREQUENCY INTERLACE

To make possible this accu placement of sideband energy, i essential to achieve very accu control over the frame, line and s carrier frequencies. Hence the son for our earlier statement ab transmission standards.

The method of approach is ferred to as "frequency interla

Figure 2 shows an idealised ture transmission characteris based on the NTSC method adapated for the US 525-line frame standard.

It will be seen that the total sp trum width occupied by the stat is 6 Mc, as required by current monochrome standards. The p ture carrier is located 1.25 Mc hig than the bottom limit of the band.

The lower sidebands exte downwards by .75 Mc without tenuation, after which they a rapidly attenuated to virtual ze at 1.25 Mc, in accordance with t vestigial sideband system.

On the high frequency side of t picture carrier, the pass band allo for the transmission of sidebands to 4.2 Mc without attenuation. Ther after rapid attenuation takes place provide a clear channel for the F sound, 4.5 Mc. from the picture ca rier and 5.75 Mc. above the botto limit of the band.

It is assumed that the sound ca rier sidebands will not exceed the Mc limit.

Note that the color (or chromin ance) sub-carrier sideband occur at a frequency which is precisel 3.579545 Mc above the picture car rier.

ACTUAL FIGURES

Not shown on the graph are tw other vitally important figures — 15,734.264 cycles per second for the line scan frequency and 59.94 cps for the frame scan frequency. These latter figures are within 0.1 pc of their nominal values and combine with the sub-carrier frequency to produce a suitable frequency interlace effect.

Thus, even though the brilliance and chrominance information occupies a common area in the frequency allotment of the station, their energies are separated by a discreet choice of originating and harmonic frequencies.

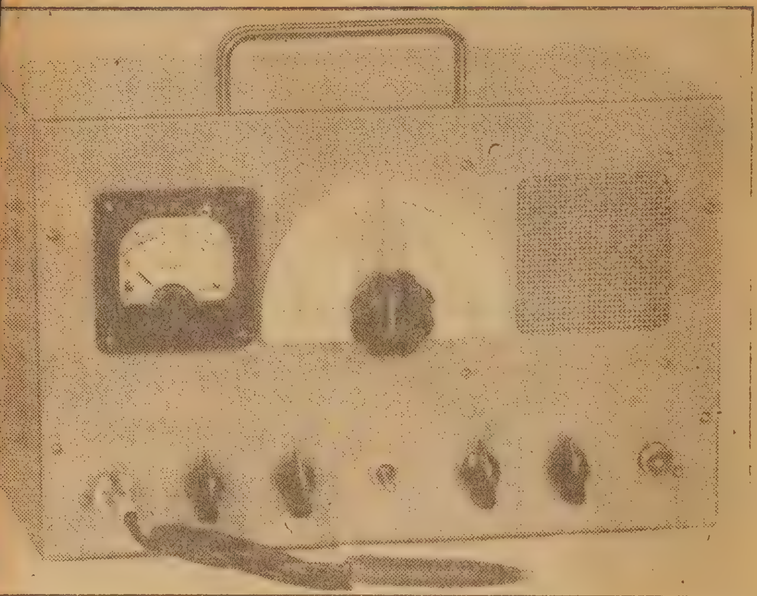
In the next issue we will discuss the circuits which apply the signals from the camera tubes to produce an output proportional to the hue and saturation of the colors in the original scene.

(TO BE CONTINUED)

R & H SENIOR SIGNAL TRACER

Ever since the description of the "Junior Signal Tracer" in the October 1952 issue, we have had regular requests for a senior version of the instrument. Well? then, here it is—achieving the desired result in a way so simple that it cannot help but intrigue you! Not convinced? Well read on.

by Maurice Findlay



front view of the new instrument. All metal parts can be ordered from the usual upply houses. It is shown with the RF probe attached. The audio probe is similar in external appearance and connects at the right.

OR those who are not familiar with the "Junior Tracer", a ief review of its features may be interest.

The major part of the instrument as made up of an audio amplifier ith built-in loudspeaker.

For tracing audio signals, a probe as connected to the amplifier via a ength of shielded wire. If, for ex- mple, you were interested in exam- ning the signal at the output of he detector of a faulty receiver, ou simply touched the probe at the equired point, adjusted the gain f the tracer to the required amount o that the signal could be heard n the tracer's speaker.

This is the usual procedure and ny tracer designed for audio work does basically the same thing.

RF COUPLING

For tracing RF signals in the case of the "Junior Tracer", a probe with a built-in crystal diode was used. A very small capacitor inside the probe served to transfer energy from the tip to the detector circuit, the attenuation brought about by the small capacitor being offset by the very high gain in the following audio amplifier.

The feature of this system is that the tracer will respond to RF signals of any frequency in which you are likely to be interested.

Place the probe on the aerial terminal and you will hear all the local stations coming in at the same time. At the grid of the first valve the selectivity of the aerial coil will make itself evident and the number of audible stations will be reduced: possibly to just one.

Transfer the probe to the IF channel of the receiver, and it will detect signals at intermediate frequency.

The significant point is that you have no means of determining the frequency of the signals coming into the tracer so that you can only assume for example that the signal at the plate of a converter valve is actually 455 kc.

Where a tuner tracer is required, the usual procedure is to build what is virtually a multi-band TRF receiver. However, it is built in the form of an instrument, usually with the speaker in the same cabinet and often a meter attached.

An immediate advantage of the tuned arrangement is that it allows the operator to identify the frequency of the incoming signal. This is of particular value, for example, when you wish to ascertain that the oscillator is operating on the correct frequency.

With a tuned tracer, it is simply a matter of placing the probe on the oscillator grid or plate and tuning the tracer for a maximum reading on the meter. The dial of the tracer will then indicate the frequency of the oscillator.

Faults which would be very difficult to pin down using the signal generator and multimeter technique, become very easy to find.

COMPLICATED TRACERS

There are a number of disadvantages in the conventional approach to signal tracers. To cover the full range of frequencies required by servicemen, you will probably need three sets of coils and accompanying switching. This is costly and sometimes difficult to get going because of the special coils required and the possible difficulties with instability.

This is all leading up to an idea which allows the advantages of a tuned tracer to be achieved much more easily.

We received a letter a short while ago from Mr. H. Thompson, of Gymea, NSW. giving details of a signal tracer, which he had built up for his own use.

Mr. Thompson's idea was to make the tracer a superhet and, rather than the usual 455 kc IF channel, to operate the tracer with an IF channel somewhere near the high frequency end of the broadcast band —say between 1600 kc and 1900 kc.

If the oscillator is now operated on the high frequency side of the incoming signal, a very wide range of frequencies can be covered with only a single small tuning capacitor. The matter may be clearer if we quote actual figures.

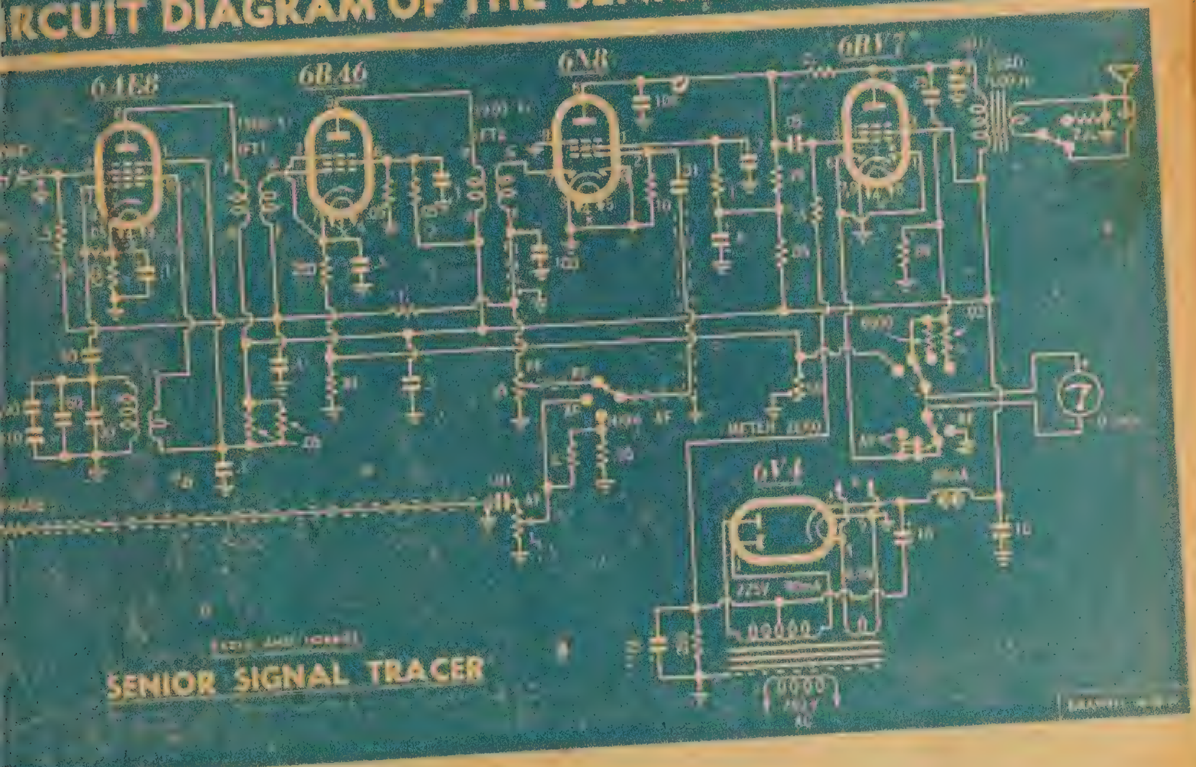
SINGLE RANGE

If the intermediate frequency is 2000 kc and the tuning range required is from 1900 kc to 150 kc, the oscillator section will be required to tune from 3900 kc to 2150 kc. This is a tuning range of less than 2 to 1.

A small capacitor can cover the required range with a single sweep of the dial.

There is no need to tune the aerial circuit of the stage for tracer work because the image signal will be well up into the shortwave bands. The intermediate frequency channel

RCUIT DIAGRAM OF THE SENIOR SIGNAL TRACER



e circuit resembles an ordinary 5 valve superhet receiver except for the high intermediate frequency and the lack of tuned circuits in the input. Metering facilities are included and means of feeding in both RF and AF signals.

ixed, of course, so that there is / the one simple variable tuned uit in the instrument. Compare : with the complicated arrangeht necessary in a TRF tracer to er the signal range of about 12½ l.

The idea sounded so good that we to work and built up a rough del for testing and developmental rposes. We were not disappointed. e instrument shown in the photoaphs is a further development of r laboratory model.

With signal tracers there are nitless possibilities for elaboration. hile reading up on the subject we me across advertisements for mmercial signal tracers in some of c overseas magazines. The comexity of some of these instruments sufficient to stagger the imaginaon of even the most sophisticated erviceman.

OF LITTLE VALUE

Some of the features may make xcellent reading on a sales specifiation sheet but frankly we don't hink they mean very much in terms of getting the receiver operating with a minimum of delay. There's no point in saving 15 minutes in finding a fault if it takes a quarter of an hour to figure out how to use the tracer to do it!

On the other hand there are some features well worth building into a signal tracer in addition to the usual basic audio amplifier and tuner sections.

A meter is particularly useful. It can be arranged to respond to either the audio output of the tracer or the RF carrier by means of a suitable selector switch. Thus it is possible to verify that the various stages of the receiver are contributing to the overall gain.

In the RF position, the meter is

PARTS LIST

1	instrument case 13in x 8in x 6¾in
1	panel 13in x 8in
1	chassis 12in x 6½in x 2in
1	5in speaker with 7000 ohm transformer
1	0-1 mA meter
1	power transformer 2 x 225V at 50mA, 6.3V
1	60 mA filter choke
1	410 pf single section tuning capacitor
2	2 pole 5 position switches
2	1900 Kc IF transformers

VALVES

1	6AE8, 1 6BA6, 1 6N8, 1 6BV7 and 1 6V4

RESISTORS

1	10 meg ½ watt
2	2 meg ½ watt
2	1 meg 1 watt
1	1 meg ½ watt
1	1 meg potentiometer
2	.5 meg ½ watt
1	.5 meg potentiometer
1	.25 meg 1 watt
1	.25 meg ½ watt
4	.05 meg 1 watt
3	.05 meg ½ watt
1	.02 meg 1 watt
1	5000 ohm 1 watt
1	200 ohm 3 watt
2	200 ohm 1 watt
1	30 ohm potentiometer
1	2 ohm 3 watt

CAPACITORS

1	25 mfd 40V
2	16 mfd 525V
1	8 mfd 525V
1	25 mfd 400V
4	.1 mfd 400V
3	.1 mfd 200V
1	.05 mfd 400V
2	.01 mfd 600V
1	.001 mfd mica
1	600 pf mica (500 pf and 100 pf in parallel)
2	100 pf mica
2	50 pf mica
1	30 pf trimmer

SUNDRIES

4	9-pin miniature valve sockets, 1 7-pin miniature valve socket with shield, 4 pointer knobs, 1 large knob, dial card, scrap celluloid, 1 toggle switch, 2 pairs of single circuit cable connectors, 2 test prods, 70 ohm coaxial cable, shielded wire, hook-up wire, tinned copper wire, spaghetti tubing, tag strips, rubber grommets, nuts and bolts, power flex, power plug, wire mesh for speaker grille, scrap aluminium, etc.

COIL DATA

Tuned winding: 26 turns 35 SWG enamel closewound on 3/4in diam. former.

Feedback winding: 24 turns 40 SWG enamel closewound 3/32in from earthed end of tuned winding.

Make YOUR choice the Famous "B.S.R."

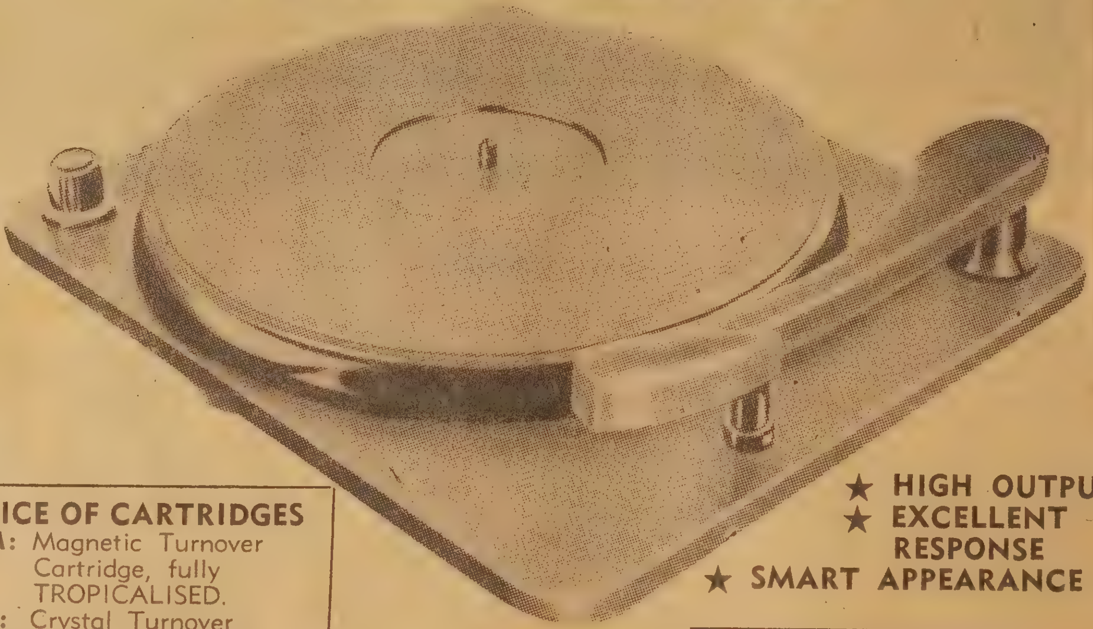
GU.4

3-SPEED (33-1/3, 45, 78)

MOTOR & PICK-UP UNIT

as selected by

"RADIO and HOBBIES" for the "PORTA-PLAYER"



CHOICE OF CARTRIDGES

GU4.M: Magnetic Turnover Cartridge, fully TROPICALISED.

GU4.C: Crystal Turnover Cartridge, type TC2.

- ★ HIGH OUTPU
- ★ EXCELLENT RESPONSE
- ★ SMART APPEARANCE

RETAIL PRICE **£13/15/-**

★ **MOTOR:** Famous B.S.R. de-luxe 4-pole induction type, 200-250 volt (with immediate change to 100-125 volts) Rim drive to heavy pressed steel turntable, recessed into deck-plate. RUBBER MAT, anti-static and non-slip, supplied with each turntable. Low rumble and vibration factor . . . no bolts to cause "wow".

★ **PICK-UP:** Lightweight pick-up of excellent response both in Magnetic and Crystal types . . . requires no weight adjustment compensation or pre-amplification. Twin-sapphire, for standard and microgroove, with turn-over knob change.

★ **SPEED CHANGE:** By external knob marked for 33 1-3, 45, 78 R.P.M., and employing the "Rotocam" method—simple and absolutely reliable.

★ **AUTOMATIC STOP:** Positive and smooth of action, operates on all types of records. Completely concealed below deck plate.

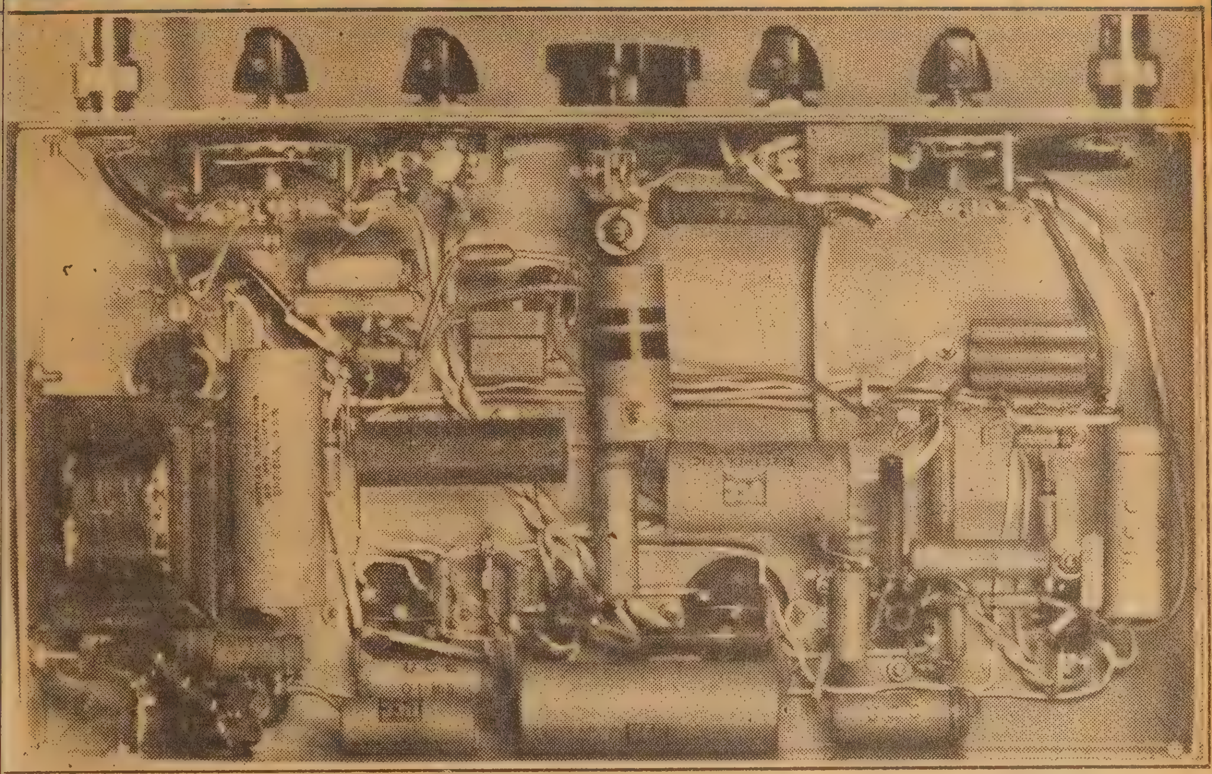
★ **FINAL SUSPENSION:** Final mounting is achieved by suspension springs fitted to deck plate . . . acoustic feedback is entirely eliminated.

Obtainable from your usual wholesaler or retailer. Enquiries to the sole Australian Agents:—

GOLDRING ENGINEERING (AUSTRALASIA) PTY. LTD.

57 H.E. Area, St. Marys, N.S.W.

UNDER CHASSIS VIEW OF THE SIGNAL TRACER



Although there is a considerable number of small wiring components they fit into the available space without difficulty. Try to keep the various leads associated with the plate of the 6BV7 clear of leads carrying low level audio, particularly the function switch.

rticularly useful for checking the cillator section of the receiver, nce it responds to unmodulated gnals.

Separate gain controls are used r the RF and the audio sections of e tracer. This feature together ith the metering facilities makes ssible a test which is very important in the testing of intermittent ceivers.

The RF probe can be attached to suitable point in the RF section the receiver and the audio probe kewise to the audio section.

With a modulated signal generator eding into the aerial terminals of e receiver, the RF gain control n be adjusted to give a particular ading on the output meter. The dio gain control can be adjusted to ve the same reading. If any change kes place while the receiver is test, it is a simple matter to deuce in which section the change has curred.

If both readings are affected the ouble is in a section of the receiver fore the RF probe while, if only e audio reading is altered, the ouble is clearly somewhere beveen the two probes. Of course if e output of the receiver under test anges while neither reading lters the trouble is clearly somehere after the audio probe.

Should the intermittent fault be such at nature that it only apears occasionally, the output of the acer can be switched to the interal resistive load while you work n another receiver. The tracer can be switched to take its input from the audio probe and an occasional glance at the meter will tell you if there has been any change.

If the occasion demands you can take steps to silence the speaker of the set under test.

The purpose of the foregoing is to illustrate the flexibility of the instrument. However, we are in danger of treading on territory which we intend to cover in a later article on using the instrument.

The next job is to give some details of the construction and circuit.

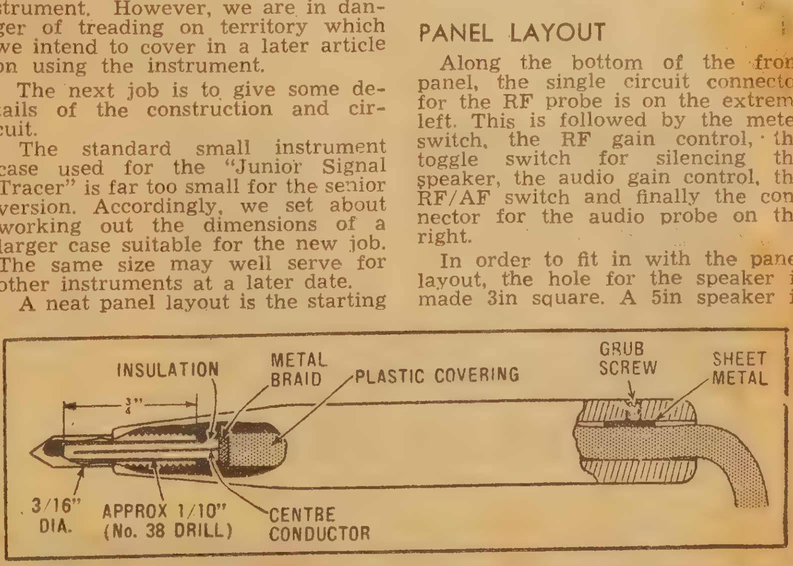
The standard small instrument case used for the "Junior Signal Tracer" is far too small for the senior version. Accordingly, we set about working out the dimensions of a larger case suitable for the new job. The same size may well serve for other instruments at a later date.

A neat panel layout is the starting point for laying out the small components on the chassis. The meter is mounted on the left and a speaker hole on the right cut to balance the meter. This leaves room for the dial scale in the centre. The exact dimensions are given on the chassis blueprint, which will be available in the usual way.

PANEL LAYOUT

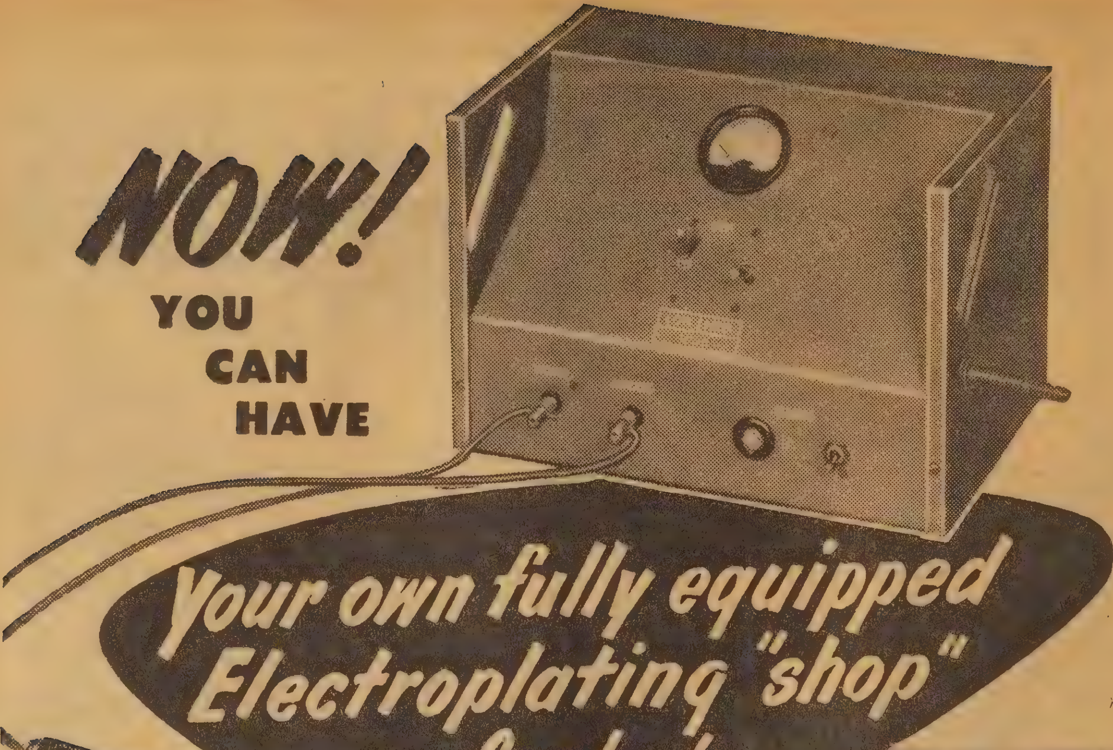
Along the bottom of the front panel, the single circuit connector for the RF probe is on the extreme left. This is followed by the meter switch, the RF gain control, the toggle switch for silencing the speaker, the audio gain control, the RF/AF switch and finally the connector for the audio probe on the right.

In order to fit in with the panel layout, the hole for the speaker is made 3in square. A 5in speaker is



A particularly neat scheme for making an RF probe to give low loading on the circuit under test. Attenuation in the connecting cable is high but this is made up for by the gain of the instrument.

NOW! YOU CAN HAVE



Your own fully equipped Electroplating "shop" for £23/18/0

plus 12½% Sales Tax

A typical example . . . T.A.A. uses Scope Portable Industrial Electroplating Unit for replating Convair airscrews with zinc.

Scope's new electroplating technique now brings these time-saving, money-saving advantages to your industry—

1. Scope is ideal for a wide variety of ON-SITE plating.
2. Its low cost brings it within reach of all workshops.
3. It saves the high cost and the inconvenience of dismantling and re-assembling equipment which was formerly sent out to the plating bath.
4. Scope's rate of deposition is remarkably high and efficient. A deposit of .0003in of zinc can be made over an area of 40 square inches in 10 minutes.
5. Scope will deposit nickel, copper, zinc, tin, cadmium, silver and gold. Deposits are non-porous, hard and bright.
6. The unit, 12in x 8 x 8, weight 14lb, is easily carried, and conveniently stored.
7. Scope's electroplating technique is mastered easily, and is ideal for a wide variety of jobs, including (a) screws, sheetmetal, fittings, with regular or irregular surfaces, (b) silver plating of light reflectors, electrical contact surfaces, including busbars, (d) "doctoring" faulty plating, (e) copper plating for selective case hardening of tools and dies without using stopping-off lacquers.

SCOPE

Portable INDUSTRIAL ELECTROPLATING UNIT

DISTRIBUTORS IN ALL STATES N.Z. Distributor: H. W. Clarke, Auckland and Wellington.

Please forward all details for Scope Portable Industrial Electroplating Unit.

Name ....

Address ....

Supplier (Optional) ....

(May)

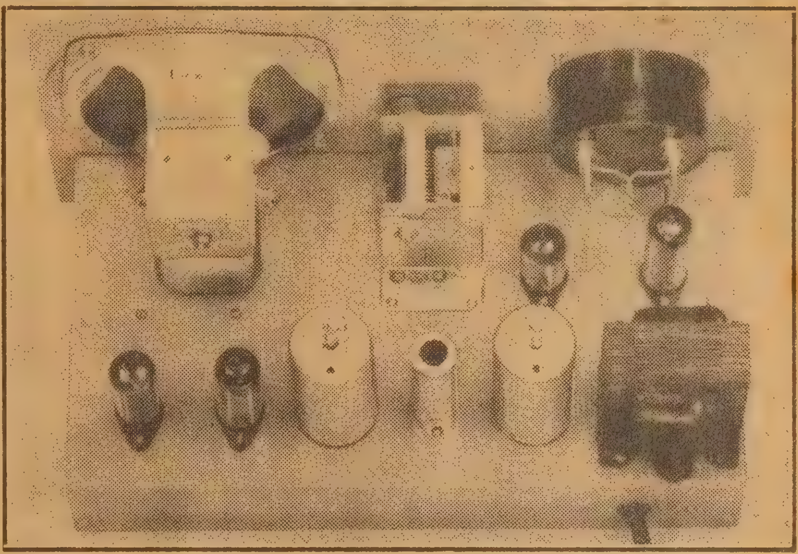
Australian & Overseas Agents:

WM. J. McLELLAN & CO. PTY. LTD.

126 Sussex St. (just North of King St.), Sydney. BX 1131

MANUFACTURED BY SCOPE LABORATORIES, MELBOURNE, VICTORIA

TOP VIEW OF TRACER CHASSIS



The chassis layout was designed so that old-style valves could be used if so desired. Alternative types are mentioned in the text.

mounted behind it, some of the area of the cone being behind the dial scale. A 3in speaker could have been used but results are likely to be much better with the arrangement we have used.

The cone area of a 3in speaker is less than the 9 square inches of the hole space, apart from which it is considerably less rugged than the 5in job.

The tuning control is a large knob mounted directly on the capacitor control shaft. You can install a vernier of some sort if you like but we found the instrument quite easy to use without one. While there is plenty of selectivity for separating the local stations, the tuning is not so sharp as to make it difficult to arrive at the correct setting.

In one sense, the absence of the vernier is an advantage in some cases because it allows a rapid change in frequency.

Another control not as yet mentioned is the meter zero potentiometer. It is used to adjust the meter to full scale deflection with no signal input and the meter switched to the RF position. It will require adjustment only if there is a wide variation in line voltage or the IF amplifier valve is changed, so that it is conveniently operated by a screwdriver slot through a hole in the front panel.

METER READING

On examining the circuit, of course, you will note that the meter reads backwards from full scale when switched to the RF position. We understand meters fitted with two scales, one reading 0-10 and the other 10-0 will be made available through the radio trade especially for the instrument.

The layout of the components on the chassis is simply a logical follow-on from the front panel layout. The frequency converter valve is mounted near the tuning capacitor to allow firm leads to the oscillator coil.

The IF and audio channels follow in logical order across the chassis from left to right. Directly behind the meter on the left is the 6V4 rectifier, and at the rear of the chassis the power transformer.

Although we have used the latest miniature valve series, there is plenty of room for old-style valves, and if you have them on hand there is no reason why they should not be used. Practically any converter valve could be used instead of the 6AE8. Types which immediately come to mind are 6A8-G, 6J8-G. ECH35, &c.

The 6BA6 has a higher gain than the usual RF pentode and this is a special point in its favor. However, a 6U7-G or a 6SK7 could be used with a slight reduction in gain.

OUTPUT VALVE

In place of the 6N8, any one of the usual diode pentodes would be suitable. Examples are the 6B8-G and 6G8-G. Even the high-mu triode type 6B6-G could be used.

The output valve is more difficult because it includes a pair of diodes, but anyone of the usual output pentodes or tetrodes could be used, provided a separate diode such as a 6H6 is used in addition.

The function of the diodes is merely to rectify the audio from the output valve for operation of the meter. As a matter of fact, there is no reason why a conventional copper-oxide bridge rectifier, as is used in AC multimeters, could not be used. Only minor changes in the schematic circuit would be required. If you are buying new valves, the 6BV7 saves the price of a meter rectifier.

For the rectifier valve, types 6X4 and 6X5-GT are direct replacements. If you have a transformer with a 5-volt filament winding, the 5Y3-GT and similar types would also be suitable. Such a transformer may have a high tension secondary higher than 225 volts and there is a possibility that the high tension voltage applied to the valves will be greater than 250 volts. This being the case, it will be a simple matter to wire a dropping resistor in series with the filter choke.

RF PROBE

At this stage a discussion of the electrical details of the circuit is appropriate.

The RF probe is of particular interest. Its purpose is to enable the tracer to be coupled to the seat at any desired point while disturbing the set as little as possible.

As you will see from the diagram, we have drilled a hole into the metal tip of an ordinary service probe and pushed the end of the inner conductor covered by the plastic insulation into the hole. (It will be necessary to reduce the diameter of the plastic by a small amount in order to do this.)

The capacity between the metal tip and the inner conductor of the coaxial cable is thus very small. In fact, it will be very much lower than the capacity between the inner conductor of the cable and the outside braid. The attenuation in the input circuit will therefore be high. This is not of any great importance because it is easily made up for by the high overall gain of the amplifying circuits.

The signal from the probe is fed directly into the grid of the converter. The latter is returned to the AVC system, which is high in value compared with the reactance of the cable capacitance at the frequencies under consideration.

The loading of the probe is so low that you can connect it directly to the stator plates of the oscillator section of the tuning gang, in the case of ordinary broadcast receivers, without noticeably affecting the tuning.

Note that the RF probe does not make provision for an earth return circuit. Normally this is provided by the earth connection via the power mains but if your service work includes battery operated receivers it would be worthwhile adding an earth terminal especially for the purpose of making direct connection between the tracer and receiver chassis.

The oscillation circuit of the converter operates at a much higher frequency than in the usual broadcast receiver. The coil can be hand-made from the data given in the parts list.

The parallel 50 pf capacitor and the series 600 pf capacitor are included with the object of giving a linear scale over the tuning range when using a standard 410 pf tuning capacitor which has shaped plates.

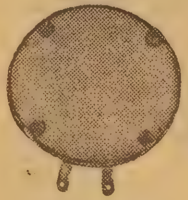
CAPACITOR

We decided on the full-size capacitor because of the possibility of adding short-wave ranges at a later date. However, if you wish, the range could be covered with a miniature tuning capacitor having a maximum value of about 100 pf connected directly in parallel with the coil and the trimmer. The 50 and the 600 pf capacitors would not be required and the tuned winding of the coil would need to have more inductance. This is something you can work out for yourself.

It is not a good idea to try to make the tracer tune below about 150 Kc. In the extreme case, with the oscillator tuned to the intermediate frequency, a strong signal will pass through the IF channel with unpleasant results.

The exact intermediate frequency you choose is worthy of some consideration. If you have a strong local station on say 1000 Kc and align the intermediate channel to 2000 Kc there may be occasions

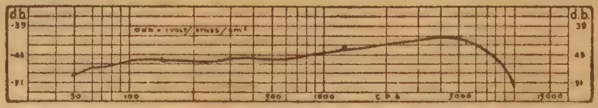
AUSTRALIAN MANUFACTURERS MEET THE DEMAND—ANNOUNCING THE ZEPHYR "MODEL IXA" CRYSTAL INSERT


1 13-16in dia.

⅝in

1½in dia. (Rear)

AVAILABLE FROM ALL RADIO STORES



APPROXIMATE FREQUENCY RESPONSE CURVE

- Australian made throughout
- Patented crystal unit guarantees outstanding efficiency and performance.
- Protected against ingress of moisture with approved moisture sealed crystal element.
- Small — compact — lightweight — durable.
- Will not blast from close speaking.
- Precision engineering ensures realistic reproduction and high output with long life and dependable operation.
- Good high frequency response ensures excellent speech reproduction.
- Aluminium diaphragm mechanically protected and frequency controlled by "Zephyrfil" filter.
- Hum shield fitted over rear.

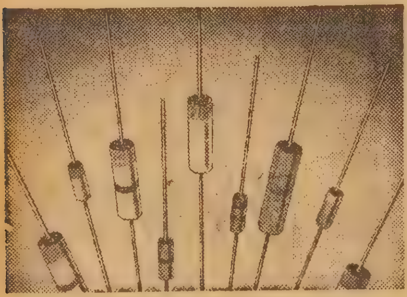
If unable to obtain from your Dealer write direct to:—

ZEPHYR PRODUCTS PTY. LTD.
118 WATTLETREE RD., ARMADALE. SE3. VIC.

PRICE
57/6
RETAIL

IMMEDIATE DELIVERY

Stocked by all leading wholesalers in each State.



MORGANITE RESISTORS AND POTENTIOMETERS

MORGANITE RESISTORS Types T and R

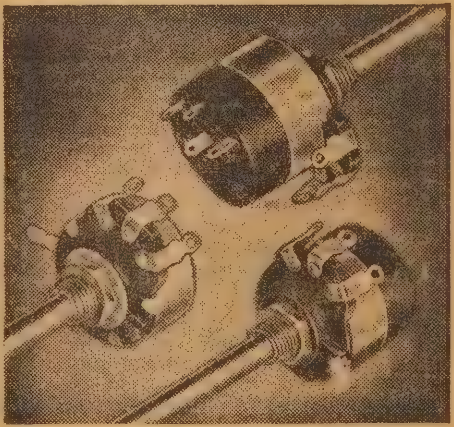
These moderately priced Resistors combine high performance with unusually small size. They are made accurately to their stated resistance values and are consistently stable.

The simple construction of Morganite Resistors provides small, robust, lightweight components of high power dissipation and low operating temperatures, and are colour coded to RMA standard.

MORGANITE POTENTIOMETERS

New in design, robust and reliable. Available non-switch and with S.P.S.T. and D.P.S.T. switches, rated and approved to 2 amps.

Overall diameter 1⅜in. Double-clench terminals eliminate noisy joints. Double-prong spring contacts in special non-tarnishing metal for resistor sweep, maintain correct pressure for minimum noise without wear. They withstand the most rigorous operating conditions.



THE MORGAN CRUCIBLE CO. (Australia) PTY. LTD.

Head Office: 65-67 Bourke Rd., Alexandria, N.S.W. Phone: MU1371. Telegrams: "Morganite" Sydney.
272 City Rd., Sth. Melbourne, S.C.5, Vic. Phones: MX6106-7. Telegrams: "Crucible" Melbourne.

when a signal from the station will be applied to the grid of the converter with sufficient strength for a harmonic to be developed and amplified by the IF channel regardless of the setting of the oscillator.

Most 1900 Kc IF transformers can be tuned 200 or 300 Kc either side of their nominal frequency so pick a frequency which is not equal to a harmonic of a strong local.

The screen and the oscillator plate of the converter are operated from a common supply. However, a separate voltage divider is used for the screen supply of the intermediate frequency amplifier. This is not to prevent instability but rather because the current requirements of the oscillator section vary over the band. Were the same supply used for both screens and the oscillator the meter zero would be different with the tracer tuned to different frequencies.

DETECTOR

In other respects the IF amplifier calls for little comment. With ordinary care with the layout of the wiring, there should be no problem with instability.

The detector is a conventional diode which supplies an automatic gain control voltage for the RF valves as well as performing the detection function. This is to be preferred to a delayed AVC system, because the signal strength meter is able to operate on very weak signals.

The diode load also serves as a volume control and audio is taken via the switching system to the audio section of the tracer. The audio probe is also introduced at this point.

To prevent excessive loading on high impedance circuits a 1.0 meg resistor is wired between the probe tip and the inner conductor of the connecting cable. A capacitor is included in the circuit to prevent the passage of direct current through the volume control. Otherwise it would tend to be noisy when connected to, say, the plate of an audio amplifier.

There may be occasions when you will wish to check an audio signal at a very high level. A voltage divider system provides a substantial attenuation so that the gain control will behave smoothly.

GRID BIAS

Grid bias for the 6N8 is obtained by means of a high value resistor between the grid and cathode. The scheme is perfectly satisfactory in practice and saves components. The conventional screen dropping resistor and plate load are included, the high tension being supplied via a decoupling network with the object of keeping the hum level down to a minimum.

From the 6N8 the audio signal is fed into the 6BV7 via a coupling capacitor. We did not find a stopper resistor necessary in the case of our laboratory prototype but, should there be difficulties with parasitic oscillation, an almost certain cure would be to insert a .05 meg ½-watt resistor directly in the grid lead of the 6BV7.

Bias is obtained by inserting a resistor in the negative high tension supply rather than from a cathode resistor because it is desired to earth the cathode for the operation of the audio output meter.

A small amount of negative feedback is introduced by wiring a resistor between the plates of the 6BV7 and the 6N8. It reduces the gain slightly and helps to smooth the audio response but, if you so desire, it could be increased in value or removed altogether. In the latter case, careful attention to the wiring layout may be necessary in order to ensure complete stability.

The audio output meter circuit uses the diodes of the 6BV7 in a simple series half-wave circuit. Although not strictly necessary, we have provided a total of three ranges. The highest includes a .02 meg series resistor and will handle audio outputs up to the overload point of the 6BV7 and/or speaker.

The range with the 5000 ohm series resistor will probably be the most useful. The maximum sensitivity possible with the system is obtained when the series resistor is omitted altogether. A certain amount of distortion is introduced in this position but it is only noticeable under certain conditions.

The purpose of the .05 meg resistor may not be apparent at the first study of the circuit, but you can take our word for it that the meter circuit will not work if it is not included.

There will be plenty of occasions

Vacuum Thermal Delay Switches

Ideal For Limiting Application of AC to Rectifiers Until Tubes Warm Up

RATING	DLS.10
Filament Voltage (volts)	4.0
Filament Current (amps) **	1.5
Delay Time at 4.0 v. (secs)	min. 30—max. 90
Maximum Peak Current (Low Voltage Rating)	6 amps at 250 v.
Maximum Peak Current (High Voltage Rating)	200 mA at 1 kV.

** At approximately 4.0 v.

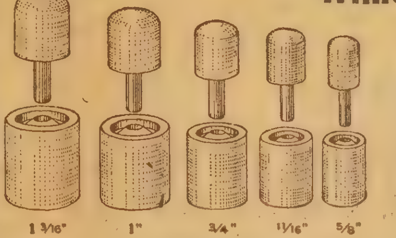
12/6 EACH

"Woden" Modulation Transformers

Type UM2, 60 watt (Audio) £9/17/3
Type UM3, 125 watt (Audio) £12/2/6
(INCLUDING SALES TAX)

Write For Impedance Matching Range-Chart.

"Willis" Chassis Punches



Made especially for the radio man
Guaranteed 10,000 holes if not misused

Size	Price
3/8in	19/6
½in	19/11
5/8in	19/11
11/16in	21/6
¾in	23/3
1in	29/10
1-3/16in	33/2
Q-Max 1in Square Chassis Punch,	53/11

(PRICES INCLUDE SALES TAX)

Highest Grade Tool Steel Only Used in the Manufacture of these Punches. Range of Sizes Covers all Valve Socket Diameters. British Q-Max 1in Square Punch, 53/11.

"Goodmans" Axiom 150 MK11 Hi-Fidelity Speakers

Voice Coil Impedance 15 ohms—Handle 15 watts—Cone Resonance Reduced to 35 C.P.S. Ideal for all high quality Hi-Fi Amplifier installations. Trade enquiries invited. Retail £22/16/-

SPECIAL LINES! For the Builder and Experimenter

UCC 55 mfd Can Type Electrolytic Condensers. 350v. DCW .. 5/-
EDDYSTONE Cat. No. 763 Miniature 4-Pin Low Loss Coil Formers .. 4/5
EDDYSTONE Cat. No. 707 Miniature 4-Pin Base to suit Formers .. 5/10
(Silver plated contacts on Former and Socket base.)
BULGIN S580/1 Thermal Flasher Unit—Ideal for "ON" indication .. 8/6
EDDYSTONE MICRODENSERS—The only type for Short-wave and V.H.F. work.

Cat. No. 580 Single section 12.5 PF, 16/9
Cat. No. 581 Single section 60 PF, 21/6
(Screwdriver adjust.)
Cat. No. 582 Single section 60 PF, 21/6
Cat. No. 583 Split-stator 25 x 25 PF, 19/9
Cat. No. 584 Butterfly 34 x 34 PF, 20/11
Cat. No. 585 Single section 100 PF, 27/6
Cat. No. 586 Single section 140 PF, 28/8
Cat. No. 587 Butterfly 15 x 15 PF, 23/11
Cat. No. 588 Single section 27.5 PF, 19/1
Cat. No. 589 Single section 54 PF, 21/6
Cat. No. 738 Single Section 100 PF, 39/6
(Double Ceramic End Plates.)
Cat. No. 739 Butterfly 8 x 8 PF, 23/11

(PRICES INCLUDE SALES TAX)

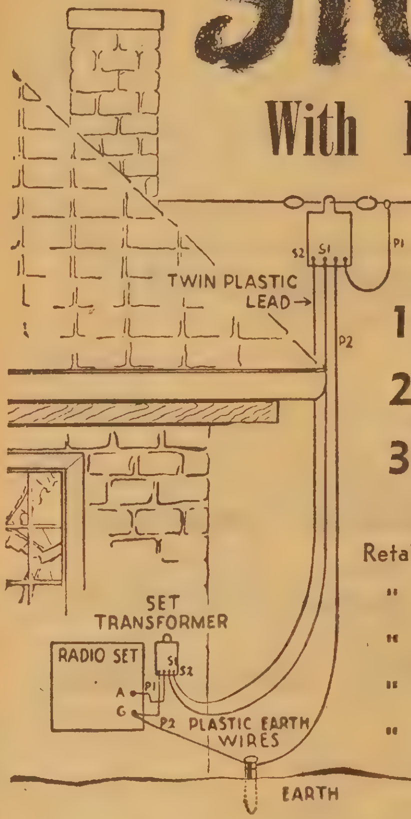
Brookes Crystals Ltd. Type "S" 1000 Kc/s Calibration Crystals .. £4/10/-
Brookes Crystals Ltd. Vacuum type 100 Kc/s Calibration Crystals .. £7/6/3
Chrome Instrument Handles — 7½in .. 14/3 pr.
T.C.C. "HYKONOL" Photo-flash Capacitors 28 mfd, Type HK 28, 2.5KVA, £9/-/-
T.C.C. "HYKONOL" Photo-flash Capacitors 33 mfd, Type HK33, 2.5 KVA £10/-/-
(Plus Sales Tax.)
Belling and Lee 300 ohm Transmission Line, Type L692 .. 1/3 per yard
Acorn Valves, Types 954 and 955 .. 10/- ea.
PLEASE INCLUDE FREIGHT AND EXCHANGE WITH ORDERS.

WILLIAM **WILLIS** & CO. PTY. LTD.
428 BOURKE STREET, MELBOURNE, C1
Phone MU2426

Mail Orders Specially Catered For. Write For Details on All Your Requirements

STOP NOISE IN YOUR SET

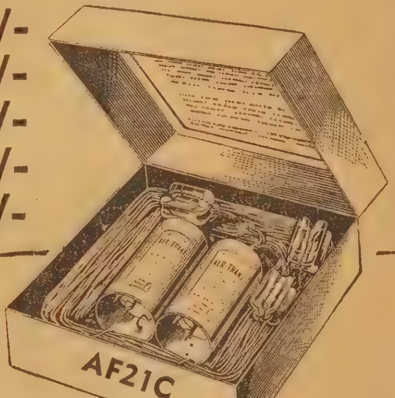
With R.C.S. aerial and line filters


S2
S1
P1
TWIN PLASTIC LEAD
P2
SET TRANSFORMER
RADIO SET
S1
S2
A
P1
G
P2
PLASTIC EARTH WIRES
EARTH

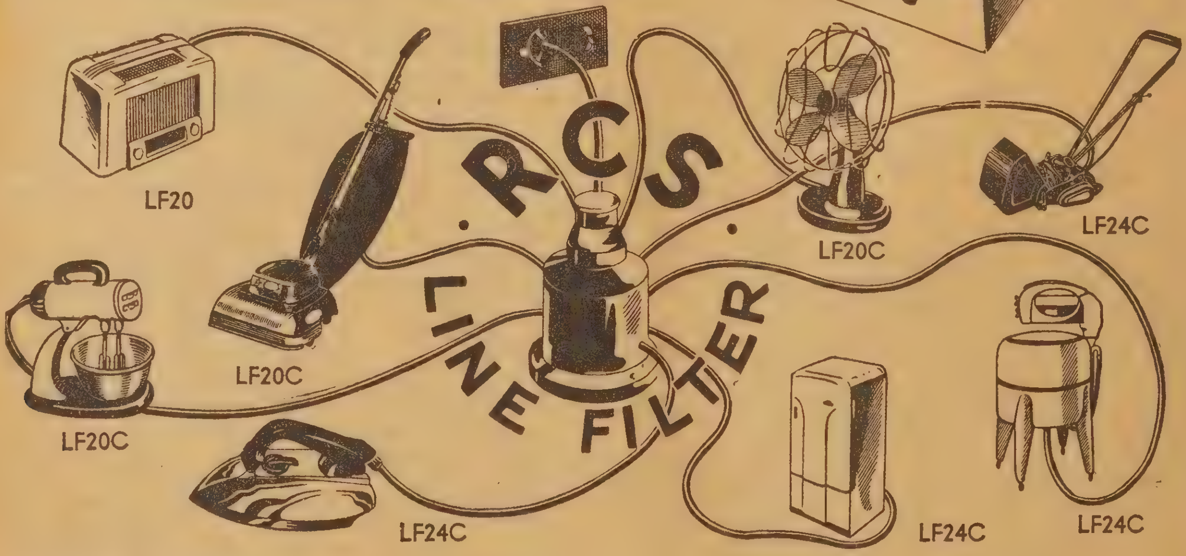
MAKE THIS SIMPLE TEST:—

1. Remove aerial from set. If the noise stops, you need an AF21C aerial filter, as the noise is coming through your aerial.
2. If the noise continues, you need an LF20 line filter as the noise is coming through your power main.
3. If any of the appliances shown below are causing the noise, then fit to it a line filter of the type shown.

Retail	AF21C aerial filter	140/-
"	LF20 line filter ..	37/-
"	LF20C " " ...	42/-
"	LF24 " "	50/-
"	LF24C " "	55/-



CONFINE NOISE WHERE IT STARTS — WITH R.C.S. LINE FILTER


R.C.S.
LINE FILTER
LF20
LF20C
LF24C
LF20C
LF20C
LF24C
LF24C
LF24C

DISTRIBUTORS:—

N.S.W. Bloch & Gerber—Fox & MacGillycuddy—U.R.D.—John Martin — Lawrence & Hansom — Homecrafts — Martin de Launay — Radio Despatch — Cooke Bros. —

W.A. Carlyle & Atkins

S.A. Gerard & Goodman.

VIC. R. E. Trickey—Homecrafts—Motor Spares—Radio Parts.

QLD. B. Martin & Irvine—Chandlers.

TAS. Homecrafts — W. G. Genders.

R. C. S. RADIO PTY. LTD.

651 FOREST ROAD,
BEXLEY. PHONE LW 3491

when you will be content to observe the output meter readings without audible output from the speaker. For this purpose a load resistor and switch are provided. The resistor should have approximately the same value as the impedance of the speaker voice coil.

We intend to publish some notes on the operation of the instrument in the following issue. Its possible uses cover a very wide field and you can take our word for it that you will have serviced a large number of different types of receivers before all the instrument's potentialities are realised. You will quickly see however, that signal tracing allows a direct approach to problems which can only be solved by lengthy around-about means when the usual multimeter-signal generator methods are used.

HELP REQUESTED

Below is an extract from a letter from Mr. A. G. Adams of "Maryport", Mt. Martha, Victoria.

"Would some of your Victorian readers with obsolete and unwanted gear on their hands be interested in donating it to the Radio Section at "Maryport", Victoria's Commonwealth Rehabilitation Centre for disabled persons, where it would serve a ready and very helpful purpose in the cause of assessment, training, and experimentation?

"As most rehabilitees have no income other than an invalid pension or sickness benefit allowance, the private financing of building and experimental projects is severely limited.

"Shopping around is also difficult, due to physical handicap — some of us are polios and paraplegics, heavily calipered or confined to chairs, others single or double amputees awaiting artificial limbs, and multiple fracture cases.

"Anyone who may wish to rally could get in touch with Radio Section, "Maryport", Department of Social Services, Rehabilitation Branch, Chancery House, 485 Bourke St., Melbourne."

BOOK REVIEW

METALWORK FOR STUDENTS, by R. Marrcott published by Macmillan and Co. Ltd., London, 1953. Octavio, 222 pages, hard cloth cover.

The author has spent some time as instructor at various British teaching institutions and the book reflects his approach to the subject.

It begins with a general treatment of the manufacture of both ferrous and non-ferrous metals and their alloys followed by notes on general benchwork and fitting. After treating the hand tools likely to be met in any course in metalwork he goes on to devote special chapters to smithing, tinplate work, lathe work and decorative sheet metal work.

The book is illustrated throughout by numerous line drawings which tend to be more valuable than photographs for this subject because the confusing background detail is excluded.

Students undertaking a secondary course in metalwork would find the book a worthwhile addition to class notes.

The Australian price is 14/3. — MVF.

FASTER MAIL ORDER SERVICE

The Exclusive
MAIL ORDER HOUSE

ALUMINIUM CHASSIS.
All chassis have welded ends. The most popular sizes listed. Specials made to order.

6 x 4 x 2	5/10
8 x 5 x 2½	7/11
10 x 6 x 2½	9/4
11 x 8 x 2½	11/5
13 x 7 x 2½	11/5
13 x 10 x 2½	14/-
17 x 8 x 3	17/6
17 x 10 x 3	19/3

Please add postage.

ALUMINIUM PANELS.
We specialise in either 16 or 18 gauge panels; listed are the most popular.

16 Gauge. .050in Thick.

6 x 5½,	3/-	12 x 8,	6/6
7 x 7,	3/3	14 x 8,	7/6
11 x 5½,	3/3	18 x 9,	11/4
9 x 8,	4/10	16 x 12,	13/-

18 Gauge .040in Thick

7 x 5,	2/3	12 x 8,	4/6
9 x 7,	3/5	14½ x 8,	6/-
11 x 8,	4/6	18½ x 12,	11/4

BAKELITE PANELS.
Black Finish.

6 x 6	6/-	9 x 8	10/6
7 x 7	7/6	12 x 8	15/9

Please add postage.

ALUMINIUM BRACKETS.
Three very popular sizes to suit all jobs.
2 x 4, 2/4; 3 x 5, 2/4; 4 x 6, 3/-.

INSTRUMENT CASES.
Lift-up Lid.
15¼ x 7 x 8¼ deep. Suits chassis 11 x 8. Price 61/9, add postage.

METAL CASES.

"A" 5 x 5 x 4 deep	15/9
"B" 7 x 6 x 4½ deep	17/3
"C" 9 x 7 x 5½ deep	18/9

Add postage.

UTILITY METAL CABINET.
One of the most popular cabinets made. No workshop or den is complete without them. For all those small parts. A place for every part. All the 16 drawers have provision for fitting identification cards. Just right size, 12 x 9 x 5½in deep. Attractively finished in grey baked enamel. OUR PRICE 48/-
Postage: Vic. 2/9; other States 5/-.

METAL CASE
(Louvred Sides).
Model 206. Ventilated type. Black wrinkled finish, loose front panel. Size 11 x 5½ x 7in high. Panel size 9 x 7. Suits chassis 8 x 5. Our Price 26/9. Add postage.

AMPLIFIER CASES.
Best quality 18G metal. Consists of base chassis, chassis cover and plate, sloping front. Black wrinkled finish. Small size, 12 x 9 x 7½ deep. Price 52/6. Med. size, 18 x 10 x 10. Price 67/6.
Please add postage.

SPEAKER BOX.
The most attractive model on the market. Suits 8in speaker. Black wrinkled finish. Price 24/-.
Please add postage.

METER SHUNTS.
We make shunts to suit all meters. Those listed are to suit meters of 100 ohm internal resistance.
10, 25, 50, 100, 250 m/A. 14.8 and 166.6 ohms. Tolerance to .1%. Our price 6/9 each. Post free.

SUNBEAM SHAVEMASTER
The world's finest electric shaver £14. Post Free.

SLOPING FRONT INSTRUMENT CASE.
Model 202. 9 x 6¼ x 8in high. Front panel 9 x 7. Finished in black wrinkled enamel. Our price 32/6.
Add postage.

ENAMELLED WIRE.
Specially wound on neat wooden spools in popular lengths. All B&S sizes.

Gauge.	100	200	300ft.
16	9/6	17/-	25/-
18	6/3	12/-	17/-
20	4/-	7/6	10/-
22	2/9	5/-	7/6
24	2/6	3/4	4/9
26 and 28		3/4	4/9

Add postage.

BRIGHT STAR CRYSTALS.
All crystals are chemically etched to ensure that the frequency once set is permanent. Tested to an accuracy of 0.01% over temperature range of 0° to + 60° centrigrade. Both amateur and commercial frequencies catered for. Write direct to us for quote.

ITEMS NOT ILLUSTRATED
(but worth noting)
"Ironcore" Electric Razor Converters, either 6 or 12 volt, £8/15/-.
Potentiometers, 150K and 250K, 3/- each.
10K, 2/6 each, 1K, 1½K, 2½K, 3K, 8/- each.
Two Gang Midget Condensers, 11/6 each.
Rivets—
  Midget Hollow, 3/- pkt.
  Aluminium .. .. 3/- pkt.
Self Tappers—
  Midget .. .. .. 3/- pkt.
  Medium . .. .. 3/- pkt.
Merlin W/W Resistors—
  3W .. .. 2/3 ea.
  5W .. .. 2/6 ea.
Coil Formers, 1¼, 1½, 6 pin .. .. 3/9 ea.
Morse Keys. Army type, 4/6 each.
Midget Var. Condensers, 10, 15, 25 mmfd, 8/6 ea. 35, 50 mmfd, 9/6 ea. 70, 100 mmfd, 11/6 ea.
Buron Tapped Coils, 5/6 each.
Ebro Crystal Detectors, 6/6 each.

Radio RSC Supply
COMPANY
BOX 4595, G.P.O., MELBOURNE

MANUFACTURERS OF
COMMERCIAL RADIO
RECEIVERS FOR 14
YEARS

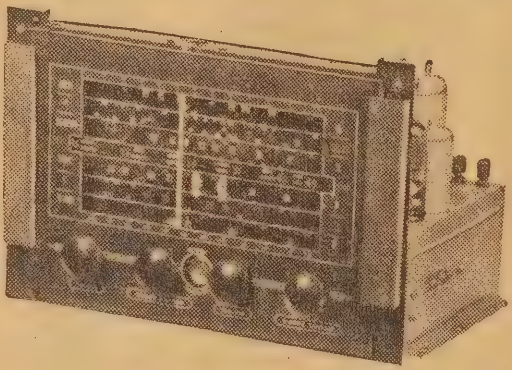
CLASSIC

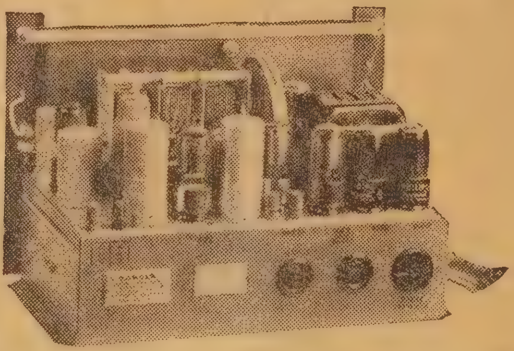
● World Range **£33/15/-** **High Fidelity ●**

9-Valve De-luxe Dual-Wave Radiogram-Chassis

Including Magic-Eye Tuning Indicator With Matched Dual Speakers

FREIGHT
EXTRA





COMPARE THESE FEATURES

- Ultra modern circuit with new high gain valves and permatuned iron cored coils and intermediates giving good interstate reception and a short wave range of 12,000 miles.
- High gain audio with push-pull output and tone control gives you high fidelity reproduction from both radio and your favorite recordings. Inverse feedback incorporated.
- Power switch is fitted to the tone control of all chasses thus enabling the power to be completely switched off from the set. Radiogram switch combined with wave change switch.
- Tuning is made simple and positive even on oversea stations by the use of a super sensitive magic eye tuning indicator.
- All chasses are wired for the fitting of an F.M. or Tape Recorder. Special plug on back of chassis being provided, also standard 3-pin socket for power supply to motor.
- Speakers supplied are Magnavox 12in and 8in permanent magnet with tropic proof transformer.
- Large calibrated edge-lit dial in plate glass (11in x 7in) with main stations in each State in prominent type, fitted with counterweight drive and indicator lights on dial showing which band in operation.
- Dial can be supplied in cream or brown with matching knobs and escutcheon to suit blond or walnut cabinets.

ALL CHASSES CARRY SIX MONTHS' GUARANTEE.

A New 10-Valve Dual-Wave Radiogram Chassis

The ideal chassis for those difficult locations where reception is doubtful

Specifications as nine valve unit but with the addition of high gain tuned R.F. stage giving greater sensitivity and selectivity on both broadcast and short wave bands.

£38/15/-

Large range of Radiogram and Console Cabinets from £12

Record Players and Changers.

We have a complete range of 3-speed record playing equipment, including B.S.R. or Garrard Players, with turn-over crystal pick-ups or your choice of Garrard, Stromberg-Carlson, Collaro or the new B.S.R. 3-speed changer that will play 7, 10 or 12in records intermixed. All changers have turn-over Crystal pick-ups.

CLASSIC RADIO

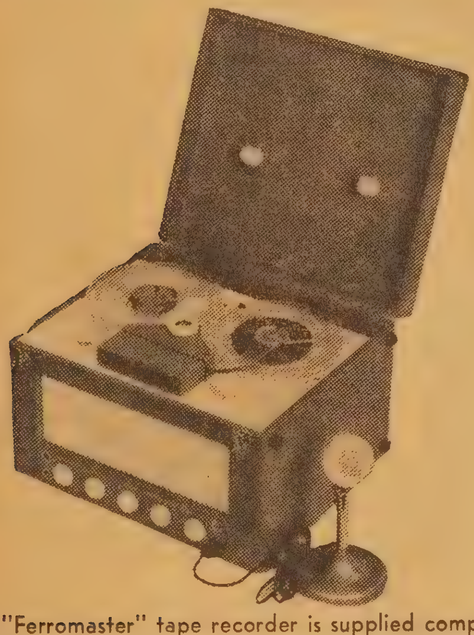
245 Parramatta Rd.,
Haberfield, N.S.W.
Phone UA2145

— RADIO

FOR
QUALITY
WITH
ECONOMY

"FERROMASTER" TAPE-DECKS
THE COMPLETE DECK AS USED IN THE "FERROMASTER" TAPE RECORDER

Is now available as a separate unit, supplied complete with high fidelity heads and "Magic-eye" recording level indicator, single knob control ready to plug into amplifier. **£47/10/-**



The "Ferromaster" tape recorder is supplied complete with crystal microphone and stand, and is fitted in durable, attractive plastic-covered carrying case with space for radio tuner, microphone and tape

PRICE **£99/10/-**
F.O.R.

A specially designed radio tuner for the "Ferromaster" Recorder is available at £9/15/- extra.

"FERROMASTER" TAPE RECORDER

The Only Unit with ALL These Features:–

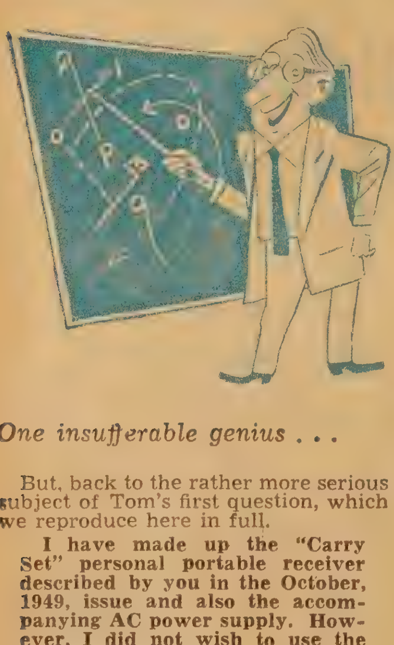
- TWIN TRACK (GIVING TWO HOURS PLAYING TIME ON ONE TAPE).
- DUAL SPEED (7½ and 3¾in PER SEC). SPEED CAN BE CHANGED BY THE FLICK OF A KNOB WHILE UNIT IS IN OPERATION IF REQUIRED.
- FAST FORWARD.
- FAST REWIND.
- POSITIVE BRAKING.
- THREE MOTORS.
- HIGH FIDELITY AMPLIFIER WITH SEPARATE BASS, TREBLE CONTROLS.
- BUILT-IN OVAL SPEAKER.
- INPUT FOR MICROPHONE, PICK-UP OR RADIO.
- PROVISION FOR EXTENSION SPEAKER.
- RECORDING LEVEL INDICATOR USING "MAGIC EYE".
- TAPE INDICATOR CALIBRATED IN MINUTES.
- FULLY GUARANTEED.

Here's your answer, Tom!

You've probably heard people observe at various times that "a little knowledge is a dangerous thing". Apparently, then, you either have to be a fully fledged professor of your subject or know nothing at all about it. We'd rather take the view that if you don't know all there is to know about a subject, consult someone who knows more than you do. After all that is the whole idea of this page.

JUST by the way, this reminds of a remark made by one of the more cynical members of Radio and Hobbies staff. The subject under discussion was the present tendency toward specialisation in technical education.

He was of the opinion that if the present trend continued there would be fewer and fewer people knowing more and more about less and less, until, finally, there would be one insufferable genius knowing absolutely everything there is to know about nothing at all!



One insufferable genius . . .

But, back to the rather more serious subject of Tom's first question, which we reproduce here in full.

I have made up the "Carry Set" personal portable receiver described by you in the October, 1949, issue and also the accompanying AC power supply. However, I did not wish to use the floating cell principle as employed by you, and therefore omitted it.

On constructing the power unit according to your directions and using the components specified by you, I found, checking the voltage before pluging the set in, that the "B" supply pins showed 235 volts and the "A" supply about 5.5 volts.

I tried all kinds of modifications to get the voltages down until finally I had to put a 100,000 ohm resistor on either side of the 8 mfd electrolytic to get the "B" supply back under 90 volts and two 1250 ohm resistors to get the "A" supply back to 1.5 volts.

However, it seems to me that the amps have gone.

Seeing that I have spent quite a few bob and put in a great deal of time on this, I would like to make it a success.

First of all, Tom, we would like to stand you on the carpet, in a mild sort of way. You did not construct the power supply according to our directions, because you left out the dry cell across the filament supply line. We had some very sound reasons for including the cell, as we usually have for including any components, and the supply will not give satisfactory results without it.

Had the cell been connected as specified, you would have measured about 1.5 volts across the filament line either with or without the set connected. However, its main purpose is to filter out the last remaining hum in the set when the filter chokes and capacitors have done their job. It is very difficult and expensive to do this with standard chokes and capacitors.

Without the set connected, the current flowing through the dropping resistors in series with the high-tension supply will be very small; in fact, only the leakage resistance of the electrolytic capacitor.

Ohm's law, when arranged to calculate the voltage drop, knowing the resistance and the current, states that:

$$V = I \times R$$

You can see, therefore, that for V to be high when I is almost zero, R has to be high. That is what you have done in introducing the extra resistance.

However, when the set is connected it draws an appreciable amount of current from the supply and therefore a much smaller R is required to give the correct voltage drop.

To put it into everyday language, the voltage output of the supply drops when the load of the receiver is connected.

We suggest that your supply will work perfectly when you connect the dry cell and restore the specified values of resistors.

If you still are not satisfied and would like to check before connecting the valves, the only thing we can suggest is that you make up a set of resistors to simulate the internal resistances of the filament and high-tension circuits of the set and measure the voltages appearing across them with the supply connected.

Why should 1.9 Mc IF transformers give better performance than 455 Kc standard type? If they do, why are they not generally used?

Who said they do? In general, the lower the frequency of the IF channel the greater selectivity and gain. Therefore, if you require gain and selectivity you choose a low IF.

The disadvantage of a very low IF is that the required signal and the "image" are close together and it is difficult to make the RF circuits sufficiently selective to differentiate between them. Frequently, then, the chosen IF is a compromise between gain and selectivity on the one hand and image rejection on the other.

For reception on the standard broadcast band between 550 Kc and 1600 Kc, 455 Kc appears to be a good choice of IF.

At higher frequencies, rather than use extra tuned circuits to reject the image signal it is often easier to use a higher IF initially, converting to a lower IF later to provide the required gain and selectivity. Such a set is described as a double superhet.

Which is best?

However, there are times when the extra selectivity is not required. A notable case is the high fidelity tuner described recently where sharp tuning is deliberately avoided in order to get full audio response. In this case the selectivity is very poor compared with a communications-type receiver but it is nevertheless good performance because it is what is required.

To ask whether 455 Kc is better

han 1900 Kc is like asking whether speedboat is better than a racehorse. t depends on whether you are conidering their speed on land, their peed on water or their intake of haff.

★ ★ ★

Is there any difference between a ransceiver and a transmitter-receiver nd if so which is the better?

We believe that the subject has een brought up before, Tom, but erhaps there are others who have ot read the previous reply.

Fairly obviously, both are devices or transmitting as well as receiving adio signals. We know of no offiial basis for the distinction but usualy a transmitter-receiver refers to device where the transmitting and eceiving units are completely seprate except, perhaps, for the power upply.

"Transceiver", on the other hand, s used to describe a device in which art of the receiver unit is used for he transmitter and vice versa. For xample, the audio amplifier of the eceiver could easily be used as the modulator of a small transmitter.

In many cases this would save two valves, as well as a number of small omponents. In small transceivers, we have known the idea to be taken so far that every valve in the unit erved a dual purpose.

Again, we know of no official basis for the usage which appears to have been brought about by general consent.

There is no general rule as to which is the better but in the case of small transceivers performance is sometimes sacrificed for cheapness and compactness.

★ ★ ★

If I wish to replace a loudspeaker with a resistive load, what value resistor should I use?

The resistor should be the same value as the impedance of the speaker and capable of dissipating the audio power involved without overheating.

The value quoted is the impedance at 400 cps and in the case of a speaker will be different at other frequencies. However, there is little that can be done about it, unless you are prepared to set up a very complicated circuit to simulate the speaker.

If the resistive load is to be placed directly in the plate circuit of a valve it will be necessary to connect a choke in parallel with the load in order that the DC voltage applied to the valve will not be reduced. The choke should have a relatively low DC resistance but a high impedance at all the audio frequencies in which you are interested.

★ ★ ★

How do you calculate the resistance offered when two resistors are connected in parallel?

There is a standard formula for arriving at the required value, Tom, and it is simply a matter of substituting the values and doing a little arithmetic.

$$R = \frac{R_1 \times R_2}{R_1 + R_2}$$

Where: R1 and R2 are the values of the two resistors and R is the resultant value.

It is not nearly as complicated as it may appear at the first encounter. Simply multiply the values of the two resistors together and divide the result by the sum of the two resistors.

For example, say that you wish to find the resultant value when a 500 ohm and a 1000 ohm resistor are connected in parallel.

$$R = \frac{R_1 \times R_2}{R_1 + R_2} = \frac{500 \times 1000}{500 + 1000}$$

$$= \frac{500.000}{1500} = 333 \text{ ohms}$$

As a check, note that the resultant value must always be lower than either of the resistors singly. A few sample calculations and the idea will be firmly imprinted on your mind. It is a good idea to make an estimate of the final result as a check on errors in arithmetic.

If both resistors are the same value the formula is simplified as follows:

$$R = \frac{R_1 \times R_1}{R_1 + R_1} = \frac{R_1^2}{2R_1}$$

$$= \frac{R_1}{2}$$

Thus it is simply a matter of dividing the value of the resistors by 2. For example two 50,000 ohm resistors connected in parallel have an effective value of 25,000 ohms.

★ ★ ★

If the frequency of the mains was increased beyond audibility, would a receiver need to have a filter in its power supply?

Yes Tom, a filter would still be necessary and in some ways it might be more difficult to design than a conventional filter to operate at low frequencies.

Although the fundamental of the supply would not be audible, possible harmonics could hetrodyne with components in both the audio and RF sections of the receiver to produce audible signals.

True the chokes and capacitors required to filter the signal would be smaller in size than with the usual frequencies but the difficulty would be to prevent direct radiation from the wires.

In any case it is doubtful if the scheme would be practical because of the difficulty of generating the high freqency power and transmitting it over long distances.

VERSATILE MICROPHONES

AWA RONETTE

Model HM7

- For TAPE RECORDING, compact, light and handy to hold.
- For ADDRESSES, SPEECHES &c., on table stand or floor pedestal.
- For SILENT FILMS, LANTERN SLIDE LECTURES and those hundred and one occasions when a convenient, efficient and dependable microphone is needed.

PRICE £7/3/6

Study the economy of the following prices.

O-88 for fixed bracket mounts £8/12/-.

O-88V with flexible mount cable plug, £14/15/6.

O-88U for stand mount and cable plug, £10/5/6.

Models R474 £31/-/6.
R572 £18/19/9.
R572/L £22/4/9.
RFC £14/19/2.
RFC/L £19/-/-.

S742 £16/3/6

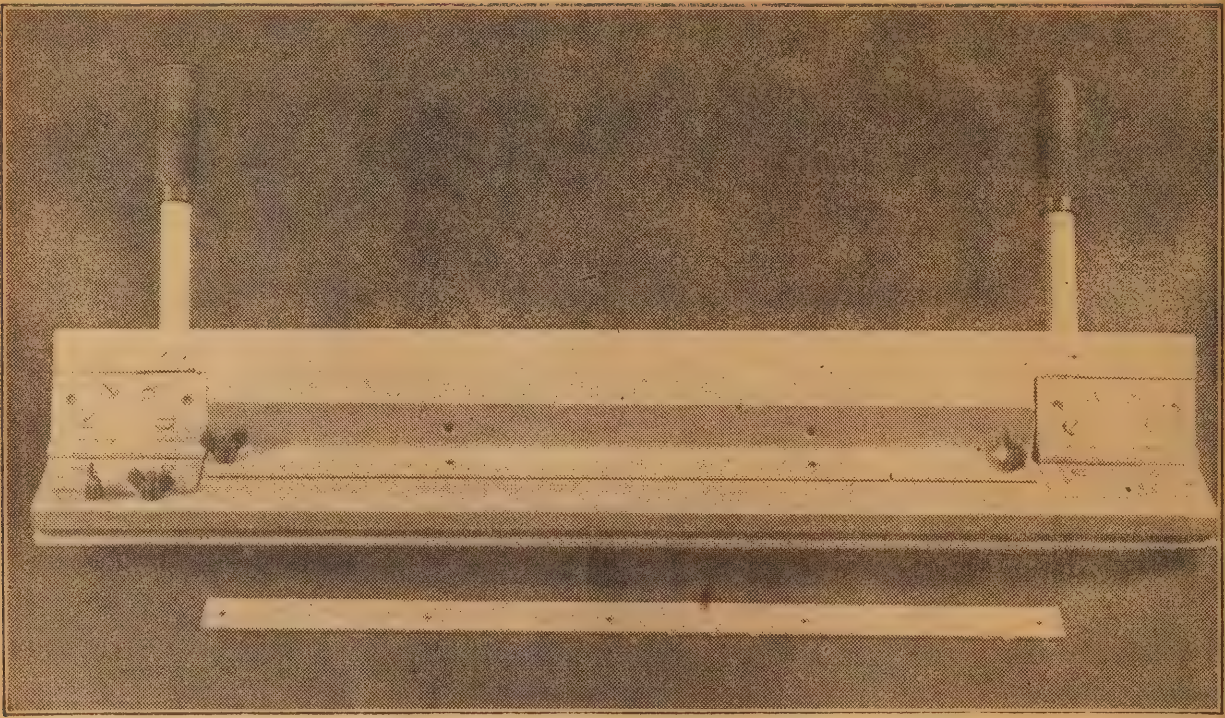
B110 £3/19/7.

GS210 £9/3/6.

GS 210/L £12/2/7

TECHNICAL PAMPHLETS WILL BE MAILED ON REQUEST

AMALGAMATED WIRELESS (AUSTRALASIA) LTD.
47 YORK STREET, B0233 — 167 QUEEN STREET, MELBOURNE, MU9161.
AVAILABLE IN OTHER STATES FROM
NEWTON McLAREN LTD., ADELAIDE. NOYES BROS. (MELBOURNE) LTD., HOBART. CHANDLERS PTY. LTD., BRISBANE. NICHOLSONS LTD., PERTH.
ALSO FROM LEADING WHOLESALERS.



The finished bender, showing the handles, hinges, angle iron etc. Diagrams herewith give details of construction.

A FOLDER FOR METAL SHEET

If you are in the habit of making your own experimental chassis and boxes, using a vice and a few blocks of wood, you have no doubt wished many times for a proper folder. Commercial units are generally too costly but here is one which will cost only a few shillings and is simple enough for any amateur mechanic to construct.

ACTUALLY constructed in our workshop for our own use, it was prompted by a desire to eliminate the tedious process of bending chassis and boxes by hand and to render us independent of other departments where equipment always seems to be tied up on other projects when we wish to use it.

When we commenced the job we had no intention of publishing a description but the final result worked out so well we considered that many readers would find the idea useful. We also commenced work with only the vaguest idea of what the finished product would look like. It more or less "just growed", like Topsy, as we added this and that until the job would perform the various functions we required of it.

MAINLY SOFT METAL

We based our design on the assumption that it would be required to handle only the softer metals, particularly aluminium, and that the heaviest would probably be about 16 gauge. On this assumption one may quite reasonably take liberties which would be ruled out if most of the work contemplated involved large bends on equivalent gauges of steel.

On the other hand it is reasonable to expect that it will handle an occasional job in this material, providing it is not too large or in too heavy a gauge. As we shall see later, there are various ways in which the unit may be made stronger if the builder so desires.

Briefly, the device consists of two pieces of stout hardwood, held together by substantial hinges, and arranged to fold to an angle of 90 degrees. The work is held against the wood by means of a length of angle iron, this forming the actual edge over which the metal is bent. Reference to the photograph and drawings will give a good idea of the assembly.

The two pieces of hardwood form the basis of the unit and in our case they measured 2ft 3in x 3in x 1 1-16in. Allowing for the hinges, this length will allow a fold up to 18in.

Experience indicates that this is about the maximum for wood of this thickness, there being a tendency for it to bow with heavy work.

SIZE IS IMPORTANT

This is where the individual should make his own choice and decide what is the largest job he is likely to handle, remembering that the shorter this dimension the heavier the work which can be undertaken. With a capacity of only 12in it is likely that mild steel could be handled without difficulty.

The wood should be dressed smooth all over and one edge on each piece should be planed straight and square. If you lack the skill and facilities to tackle this it should be possible to have the job done by the local joiners or the timber yard where the wood is purchased. These two faces are the ones which butt ogether, the junction forming the line of the bend.

The hinges used must be of a solid type, capable of handling the rather severe stresses involved without straining, since any sloppiness at this point will adversely affect the accuracy and usefulness of the device.

The ones we used measured 4in square when opened flat and were made from 16-gauge steel. They appear to be more than adequate and it is possible that smaller ones may have been suitable. However, considering that the extra cost is only a few pence, there would seem to be little point in not using the larger ones.

EXTRA HOLES

Our only modification was to drill a couple of extra holes in each wing, since those provided were further away from the pin than we thought desirable for work of this kind. The holes were ¼in diameter countersunk and we used 1½in x ¼in countersunk steel screws, with appropriate nuts and washers, to fasten them to the wood.

The location of the hinges, relative to the junction of the two pieces of wood, is most important and worth considering in detail. When the upper piece of wood is moved through 90 degrees during the bending process the front edges of both pieces should, ideally, remain in contact. In practice, something less than this can probably be tolerated, but we managed to achieve it without a great deal of trouble.

One result of incorrect alignment is that the upper section moves forward from the lower one at the same time as it folds over. This is serious if the amount of metal being bent is less than the gap so formed because, obviously, the fold cannot be completed.

The effect is brought about by the centre of the hinge pin being forward of the bending face, as when the hinges are mounted directly on the wood without recessing.

The other fault, which may or may not occur with that just mentioned, is that the bending face of the upper portion finishes its movement in a line above or below the upper edge of the lower portion. This makes it difficult to set the work out correctly before bending and to allow accurately for the thickness of the material.

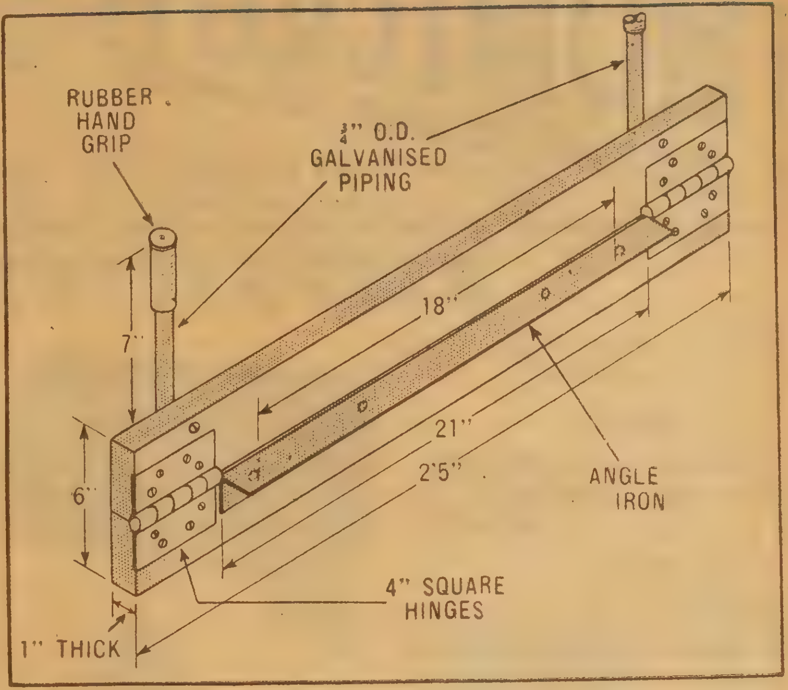
It is caused by the centre of the hinge being above or below the junction of the two pieces of wood.

CORRECT POSITION

Ideally, the centre of the hinge pin should correspond exactly with a vertical line formed by the face of the two pieces of wood, and with a horizontal line passing through their junction.

To satisfy the first requirement it is necessary to recess the hinges into both pieces of wood by a depth approximately equal to the thickness of the metal. Once again some carpentry is called for, but even the beginner should be able to make a satisfactory job with a sharp chisel and some patience.

GENERAL LAYOUT OF FOLDER



This diagram shows the main features of construction.

The second requirement simply calls for care in placing the hinges before finally bolting them into place, it being a good idea to allow a little leeway in the recessed portion to permit some adjustment as required. This final adjustment is easier if the hinges can be held temporarily while the movement is checked and before the mounting holes in the wood are finally drilled.

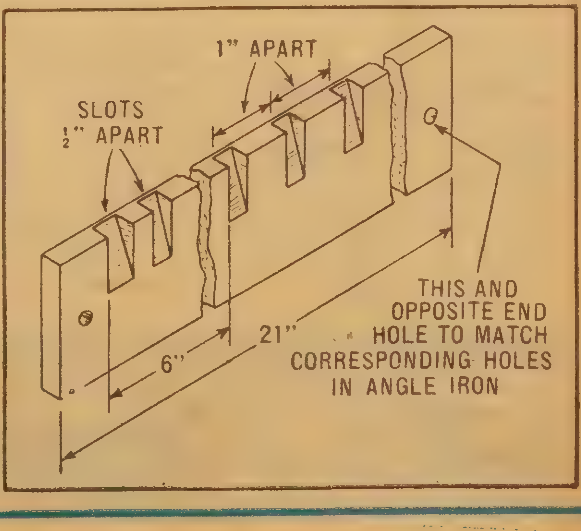
MOUNTING METHOD

One idea is to drill only one mounting hole for each wing of the two hinges, making the hole slightly oversize, and use these to hold the hinges while the movement is checked. If it is not correct the hinge may be moved slightly as required, and, when a satisfactory placing is found, the remaining holes may be drilled, correct size, and the bolts fitted.

In our case we used one of the hinge mounting bolts to attach a handle to each end of the upper portion. The screw will obviously have to be longer than the others by the thickness of the handle.

Our handles were made from a scrap length of heavy duty galvanised conduit approximately ¾in outside diameter. About 10in is required for each, and, after allowing for mounting, the effective length is about 7in. This provides adequate leverage and, in fact, it is undesirable to provide excessive leverage, since one may be tempted to tackle jobs too heavy for the device.

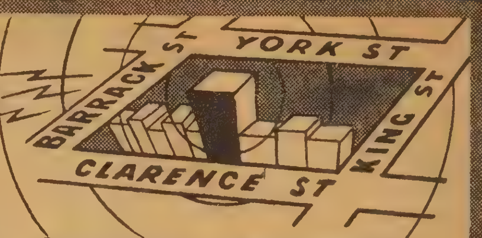
A second support point for each handle is provided by a bolt through the wood into a tapped hole in the pipe. We used another 1½in x ¼in countersunk bolt for this and the support point is near the top of


1" APART
SLOTS ½" APART
THIS AND OPPOSITE END HOLE TO MATCH CORRESPONDING HOLES IN ANGLE IRON
21"
6"

How the grooves are cut in the metal strip.

HOMECRAFTS

RADIO IS OUR BUSINESS



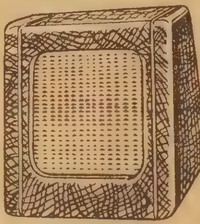
100 CLARENCE ST., SYDNEY. BX 4451
ALSO **26 HUNTER ST., NEWCASTLE**

AMPLIFIERS

The Elcon range of high quality Amplifiers

PRICES

15 Watt A.C.	**£47/18/6**
15 Watt A.C. and 12V D.C.	**£52/4/-**



DE-LUXE EXTENSION SPEAKER

CABINETS EXPANDED ALUMINIUM GRILLE

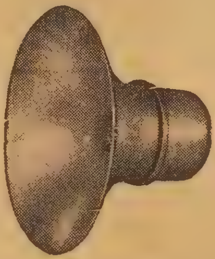
Sizes 6in, 8in, 12in for Rola Speakers — Leatherette covered.

SOUND

Spun Aluminium Flare

For 8in Speakers with Mtg. Bracket

£4/16/-



Large stocks Flares, Speakers, Speaker Boxes, etc

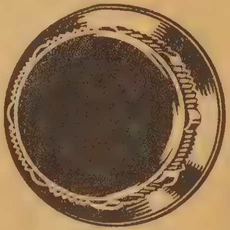
PRICES

30 Watt A.C.	**£54/15/-**
5 Watt A.C.	**£22/-/-**

AMPLIFIER CONTROL KNOBS

2 inch Flange BLACK

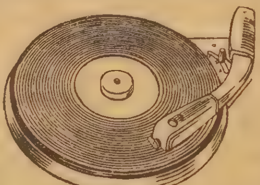
3/2 ea



3 SPEED RECORD PLAYERS

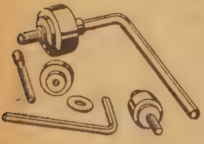
Collaro 3/534

Price £13/-/-



Also—Garrard Mod. T—Monarch Auto Changer.

Screw-Type Hole Cutters



7-pin Miniature Innoval, Octal Set of Three

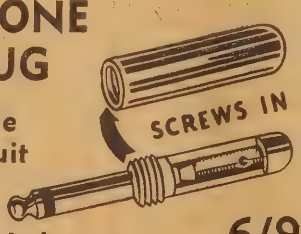
£5/7/6

ZEPHYR 8xA MICROPHONE

£7/13/-

PHONE PLUG

Single Circuit



Shielded **6/9**

WATCH • THIS • CORNER

Top Cowl Car Aerial with Lead **£1/15/-** ea.

Q plus Extension Speaker **£2/17/6**

Special 4 x 3 1-Bank Switches **5/-** ea.

Special 1-8in Spintights 3/- ea.

HOMECRAFT'S *FAST* DESPATCH SERVICE

YOUR ORDER IS ASSEMBLED BY EXPERTS AND SHED TO YOU ie wood. A couple of bicycle hand ips will finish them off.

The next section is the actual ending edge and this needs to be s rigid as possible with a sharp, early defined edge if it is to produce a sharp accurate bend. We sed a length of 1½in x 1½in x 1-8in ngle iron, and this provided all the igidity required, as well as a good dge.

ENDING EDGE

At this point we must once again onsider whether we are likely to andle springy metals like mild steel. ue to the springiness it is usually ecessary to take the bend a little ast the required angle, since the vork will spring back several degrees when the pressure is released.

For this reason the right angle ormed by the angle iron would not e ideal for such work, though we ound in practice that no such difficulty is experienced with aluminium.

The angle iron is held on the face of the lower wooden portion by means of two ¼in steel bolts and two brass wing nuts. These are located at each end of the angle iron, remembering that the distance between the inside edges is the maximum length of metal that can be held.

As well as the two end bolts we drilled two more holes closer to the centre, and so spaced as to provide a variety of distances between them. This makes it possible to apply pressure at points fairly close to each edge of the work, regardless of the width.

POSITION OF EDGE

The location of the bending edge, relative to the moving portion, is fairly critical and, to ensure that this position is always maintained without the need to set it by hand, the mounting bolts should be a neat fit in both the wood and the metal. The best arrangement is to locate the angle iron correctly, secure it firmly in place with vice or clamps, and drill both iron and wood in the one operation. Use a drill which is no larger than necessary to take the bolts.

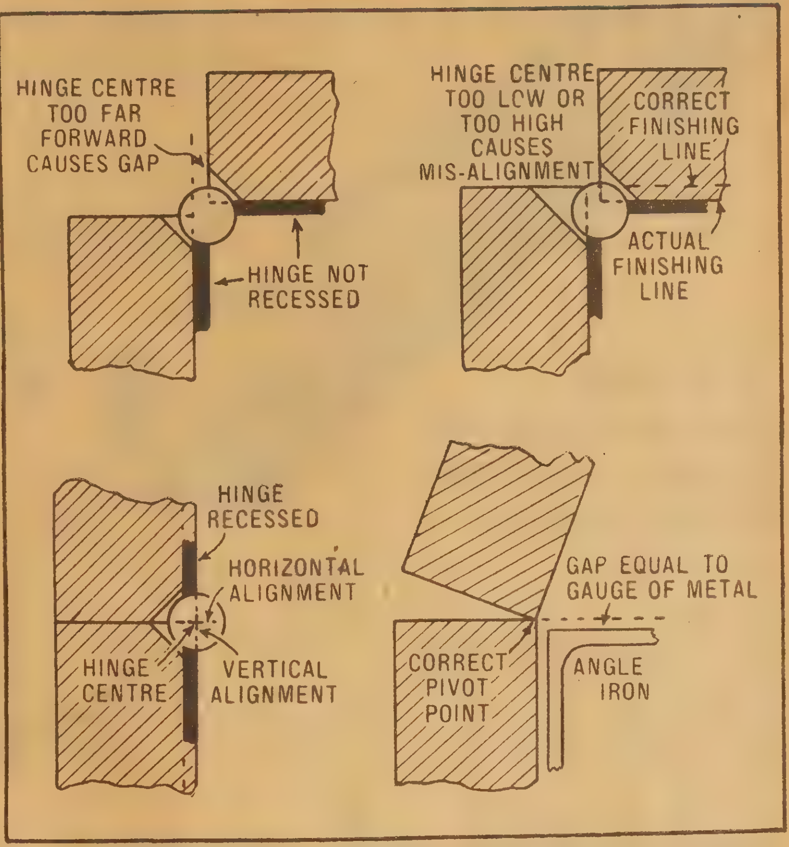
Assuming an ideal placement of the hinges the bending edge should be below the junction of the two pieces of wood by the thickness of the metal to be bent and should, ideally, be adjustable to suit different gauges of metal. In practice it appears that a setting of 1-16in is close enough to accommodate the three most popular gauges: 16, 18, and 20.

If a wider range of gauges is likely to be encountered it will be necessary to adopt a slightly different approach, either using larger holes in the angle iron and setting the edge each time by hand or providing several sets of holes in both the wood and angle iron, each set designed to suit a particular range of gauges.

FOLDING ENDS

At this stage the bender may be regarded as complete as far as the main portion goes, since it is now capable of making simple bends up to its maximum length. However, the really difficult problem with any bender is to devise some method whereby the ends of a chassis may be bent after the sides are already bent, since these latter would, in the normal way, foul the bending edge.

HOW TO MOUNT TWO HINGES



These diagrams show how the hinges are correctly mounted in place.

Commercial machines adopt a number of solutions to the problem, many of them extremely ingenious but they do not lend themselves readily to a simple design of this nature.

After many suggestions had been put forward and duly considered we finally adopted a design which appears to be a reasonable compromise between simplicity and efficiency, though there is no reason why other ideas could not be employed. In fact, it may well be that the choice of several different systems is desirable to suit individual problems.

OUR SOLUTION

We based our method on the assumption that it is sufficient to bring the bend to within 10 or 15 degrees of the required right angle, it being comparatively easy to complete the bend by hand methods without adversely affecting the quality of the job or the accuracy of the bend. Once again the use of aluminium is assumed.

We, therefore, replaced the angle iron bending edge with a length of mild steel strip, 1-8in thick, 1¾in wide, and the same length as the angle iron. This was drilled identically with the angle iron so that the same mounting holes could be used, though we found it desirable to add at least one more hole near the centre to provide an additional pressure point, since it is much less rigid than the angle iron.

The next stage was to file a number of grooves in the bending edge to accommodate the chassis sides already bent, and these were so spaced as to suit a reasonable variety of sizes. Two grooves were located near one end of the metal strip and were spaced ½in apart. One was ¼in wide and the other 1-8in. Another group, 1-8in wide, was cut at one-inch intervals and commenced at 6in from the farthest of the first two.

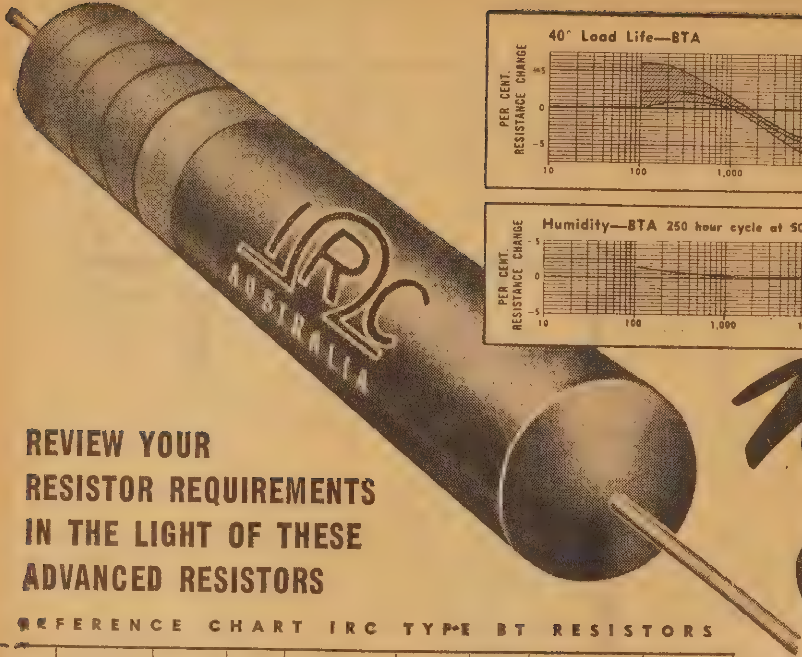
In this way a range of sizes commencing at 5½in and progressing in ½in steps may be handled, the maximum width being limited only by the number of grooves one is prepared to file. It seems quite likely that additional grooves will be required in our case, but it is proposed to leave these until the requirements can be seen more clearly.

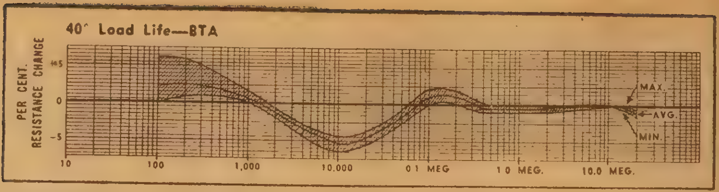
THE GROOVES

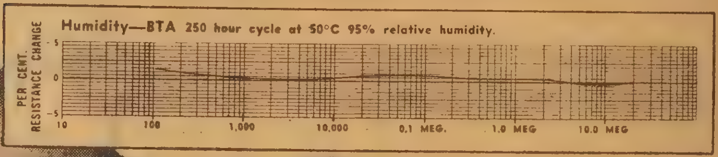
The grooves are filed at an angle to the face of the strip so that they vary in depth from nothing at a point ¾in from the edge to almost the full thickness of the material at the edge, thus leaving only a knife edge to meet the other fold which would otherwise be fouled.

Where only a narrow piece of metal is to be clamped under the

(Continued on next page.)







New

IRC

AUSTRALIA

MINIATURE TYPES BTS & BTA RESISTORS

REVIEW YOUR RESISTOR REQUIREMENTS IN THE LIGHT OF THESE ADVANCED RESISTORS

REFERENCE CHART IRC TYPE BT RESISTORS

IRC TYPE	RATING @ 40° C. AMBIENT	LENGTH	DIAMETER	LEAD LENGTH	LEAD DIAMETER	RATED VOLTAGE	MINIMUM RESISTANCE	MAXIMUM RESISTANCE
BTS	½ watt	13/32"	⅛"	1½"±⅛"	.032"	350V	*82 ohms	22 meg.
BTA	1 watt	23/32"	¼"	1½"±⅛"	.040"	500V	*100 ohms	22 meg.

* Lower values under development.

obsolete all present standards!

STANDARD RESISTANCE VALUES FOR TYPE BTS & BTA

In accordance with RMA Resistance Values

RMA VALUE	TOLERANCE			OHMS				MEGOHMS		
Add 0's for higher resistances	5%	10%	20%	10 to 91	100 to 910	1,000 to 9,100	10,000 to 91,000	0.1 to 0.91	1.0 to 9.1	10 to 91
10	*	*	*	—	100	1,000	10,000	0.1	1.0	10.0
11†	*			—	110	1,100	11,000	0.11	1.1	11.0
12	*	*		—	120	1,200	12,000	0.12	1.2	12.0
13†	*			—	130	1,300	13,000	0.13	1.3	13.0
15	*	*	*	—	150	1,500	15,000	0.15	1.5	15.0
16†	*			—	160	1,600	16,000	0.16	1.6	16.0
18	*	*		—	180	1,800	18,000	0.18	1.8	18.0
20†	*			—	200	2,000	20,000	0.20	2.0	20.0
22	*	*	*	—	220	2,200	22,000	0.22	2.2	22.0
24†	*			—	240	2,400	24,000	0.24	2.4	—
27	*	*		—	270	2,700	27,000	0.27	2.7	—
30†	*			—	300	3,000	30,000	0.30	3.0	—
33	*	*	*	—	330	3,300	33,000	0.33	3.3	—
36†	*			—	360	3,600	36,000	0.36	3.6	—
39	*	*		—	390	3,900	39,000	0.39	3.9	—
43†	*			—	430	4,300	43,000	0.43	4.3	—
47	*	*	*	—	470	4,700	47,000	0.47	4.7	—
51†	*			—	510	5,100	51,000	0.51	5.1	—
56	*	*		—	560	5,600	56,000	0.56	5.6	—
62†	*			—	620	6,200	62,000	0.62	6.2	—
68	*	*	*	—	680	6,800	68,000	0.68	6.8	—
75†	*			—	750	7,500	75,000	0.75	7.5	—
82	*	*		82	820	8,200	82,000	0.82	8.2	—
91†	*			91	910	9,100	91,000	0.91	9.1	—

* Shows values available in tolerances indicated.
† 5% values only; 10% & 20% values NOT available.

TOLERANCES: Available in ±5%, ±10% and ±20% tolerance . . . in accordance with RMA values.

PRICES: BTS, 9d; BTA, 1/-

Write or phone your supplier for full details.

IRC miniaturised Type BT **insulated** Fixed Composition Resistors have set new performance standards which will affect your planning for years to come. Exhaustive tests by independent agencies have proved the superior performance of these resistors under actual field conditions, as well as in the testing laboratory. Check the graphs and tables carefully.

STANDARD RESISTANCE VALUES

Type BTS and BTA Resistors are supplied ONLY in RMA Resistance Ranges (Radio Manufacturers' Association), subject to minimum and maximum values for each type. These standard ranges are listed at left.

SOLE AGENTS FOR AUSTRALIA
Wm. J. McLELLAN & Co.
Pty. Ltd.
[illegible] SUSSEX STREET, SYDNEY. [illegible]
(50 yards north of King Street)

bending edge it will be necessary to use a dummy piece under the opposite edge to prevent the strip from acquiring an angle relative to the wooden face. If this happens the bend will be difficult to make, very rounded, and of poor accuracy.

It was originally intended that the device should be held in the vice in a vertical position, and in many cases this is quite satisfactory. However, there are also times when horizontal working is to be preferred, this having the particular advantage that the work is easier to support and set correctly in position for an accurate bend.

To permit this we mounted a small bracket of angle iron on the back of the lower wooden portion, and which permits the device to be held firmly in the vice in a horizontal position. In this case the fold is made in an upwards direction.

ALTERNATIVE

It is fairly obvious that there are many possible variations of the entire design and to many readers it may serve merely as a starting-point for a design of their own. In this case the following brief suggestions are worth considering:

About the simplest is to strengthen the back of the upper wooden portion with a length of angle iron, this making a very substantial job if the device is intended to handle long bends.

Another idea is to retain the wooden frame, but to recess lengths of angle iron into the wooden working faces, thus providing rigid and long-wearing metal faces. This calls for a fair amount of wood working and may not appeal to those whose skill is limited in this direction.

This idea naturally leads to the final suggestion, which is to discard the wooden sections altogether and make the entire device from metal, mostly angle iron. A few problems present themselves, particularly regarding the accurate setting of the hinges, but they would not be particularly difficult to anyone with access to metal working facilities.

On the other hand the final result should be a very substantial bender, capable of handling almost any type of metal in fairly heavy gauges.

REDUCING NOISE OF AERO ENGINES

In their efforts to reduce the noise caused by aircraft at airports, several British manufacturers are working on designs for mobile sound-mufflers which could be towed around an airport and attached to aircraft before their engines are run-up.

Parallel with this work on mobile mufflers, designers are also working hard to reduce aircraft noise at its source—in the engine. Silencers so far developed for the engines themselves give hope that noise levels will be appreciably reduced in the future.

A noise is a difficult thing to assess, scientifically. Noise is actually measured by meters that record sound pressure levels. A basic reference level of pressure is taken and pressure levels above this are quoted in "decibels". To compare different sounds, it is usual to make an analysis over the range of frequencies audible to the human ear, taking readings of pressure in decibels at each octave.

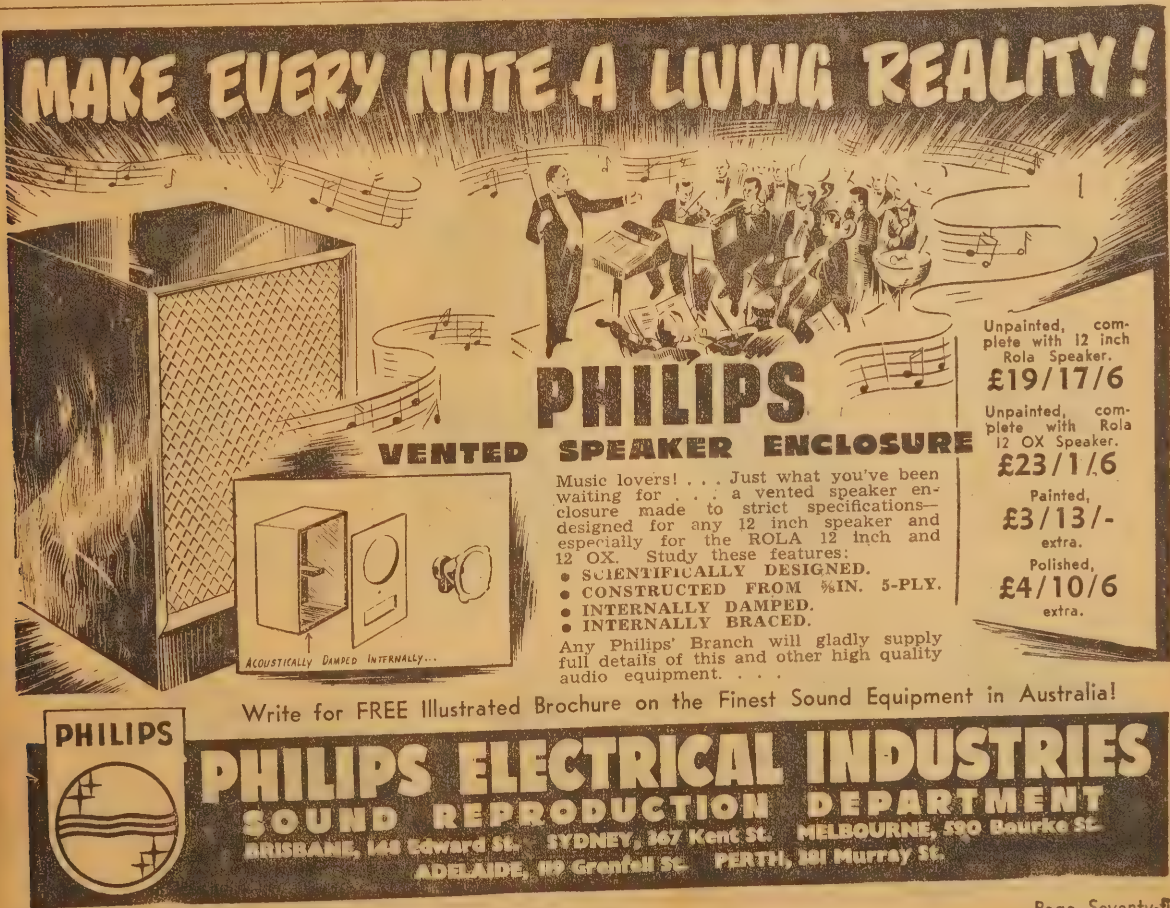
Actual loudness is measured in units called "phons", which relate noise intensity with the sensitivity of the human ear to different frequencies. A sound quoted in phons is, therefore, a cross-section of noise intensity—but a more precise definition of the same sound in decibels would involve giving a whole series of decibel readings at different frequencies.

HOW NOISY IS A JET?

There are two main sources of noise in a jet, one is that at the intake — a high-pitched whine or whistle, varying with the speed at which the compressor is run, and its size—and the noise from the jet pipe. This jet outlet noise—a low, roaring resonance—is caused by the turbulent gases inside the jet pipe and in particular by the shock waves formed by the narrow stream of very fast-flowing gases as they come in contact with the surrounding air behind the aircraft.

The greatest noise intensity is usually found in a zone between 45 degrees and 60 degrees to the axis of the jet pipe. The intensity varies, of course, with the speed of the engine.

Generally speaking, the higher the revs. at which the engine is running, the greater the volume of sound in the higher frequencies; as the engine speed is raised, high frequency noise increases at double the rate of low frequency sound.


MAKE EVERY NOTE A LIVING REALITY!
ACOUSTICALLY DAMPED INTERNALLY...

PHILIPS

VENTED SPEAKER ENCLOSURE

Music lovers! . . . Just what you've been waiting for . . . a vented speaker enclosure made to strict specifications—designed for any 12 inch speaker and especially for the ROLA 12 inch and 12 OX. Study these features:

- SCIENTIFICALLY DESIGNED.
- CONSTRUCTED FROM ⅝IN. 5-PLY.
- INTERNALLY DAMPED.
- INTERNALLY BRACED.

Any Philips' Branch will gladly supply full details of this and other high quality audio equipment. . . .

Unpainted, complete with 12 inch Rola Speaker.
£19/17/6

Unpainted, complete with Rola 12 OX Speaker.
£23/1/6

Painted,
£3/13/-
extra.

Polished,
£4/10/6
extra.

Write for FREE Illustrated Brochure on the Finest Sound Equipment in Australia!

PHILIPS

PHILIPS ELECTRICAL INDUSTRIES
SOUND REPRODUCTION DEPARTMENT
BRISBANE, 148 Edward St. SYDNEY, 367 Kent St. MELBOURNE, 590 Bourke St.
ADELAIDE, 119 Grenfell St. PERTH, 381 Murray St.

WALTHAM DAN'S *NEW* PLAN

Special for the Hobby Man

THE BARTER PLAN OF WALTHAM DAN,

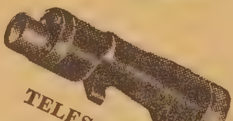
Every hobbyist has gear for which he has no further use. Maybe we can help you with the Barter Plan of Waltham Dan.

If you want apparatus from us just drop a line to:—

WALTHAM DAN
P.O. BOX 5234, MELBOURNE, C.1.

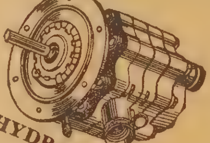
stating the type of apparatus you require, and the type and condition of the apparatus of which you wish to dispose. We will immediately advise you the price we will allow, subject to inspection, on the apparatus you wish to barter.

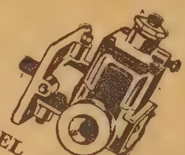
If our price is acceptable to you, carefully pack and forward the equipment to us, carriage paid. The equipment will be inspected immediately on arrival and you will be advised accordingly. In the event of the equipment not conforming to the description we will carefully repack and return same to you, carriage paid.


TELESCOPIC SIGHTS

GENEMOTORS

TELEPHONES


HYDRAULIC PUMPS

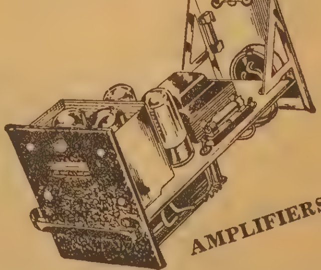


TECHNICAL BOOKS!

WHIP AERIALS FOR FISHING RODS

HOME LIGHTING EQUIPMENT

CAMPING EQUIPMENT


AMPLIFIERS

WALTHAM'S

OF SYDNEY AND MELBOURNE

SYDNEY MAIL ORDER
& RETAIL STORE,
96 OXFORD STREET,
SYDNEY, NSW.

MELBOURNE MAIL ORDER
PO Box 5234,
MELBOURNE, C.1, Victoria.

Melbourne Retail Stores,
319-321 Swanston St.,
Melbourne.
393 Flinders St., Melbourne

"WALTHAM DAN"
THE BARGAIN MAN

Australia's largest mail order house for ex-Government radio, electrical, scientific and general service equipment.

Write for our latest catalogue of the many other bargains available.

DIAL SIGHTS

Ideal for all types of levelling. Periscopic action, equipped with calibrated prism adjustment for measuring elevation and declination, azimuth circle with lock nut, two vernier knobs (adjustment for azimuth). If mounted on a tripod this Sight can be used as a dumpy level.

£6/10/0

Postage & Packing 7/6.
Interstate 10/6.

8-day AIRCRAFT CLOCKS

Precision built by Waltham Clock Co., for U.S. Navy. 24-hour dial. Sweep second hand. Tells civil date. 3½in dia. Chronometer-like accuracy. For launches, cars and trucks.

£10

Postage & Packing 4/6.
Interstate 5/9.

SEXTANTS

Type AN-5851-1. Made by Bendix Aviation Corporation of America. Bubble type, with clockwork altitude averaging device, fitted with Polaroid lens and fitting for night use. Brand new in bakelite carrying case.

£15

RADAR LORAN CATHODE RAY INDICATORS

Containing the following Valves:
1—5GP1 CR Tube with full-length Mu-Metal Shield, 8 1H6, 14-6SN7, 3—6SL7, 1—6J7.
Brand new in cartons.

£25/-/-

SYNCHRONISER UNITS

Type 1155.

Containing the following Valves:
6—6SN7, 3—6L7, 2—6AG7, 2—6L6, 1—6H6, 2—6AC7, 6—7171A.
Brand new.

£12/10/-

VITA VOX

Public Address Loud Speaker Units. Voice Coil 12.5 Ohms DC resistance. Brand new.

£12/10/-

BENDIX RADIO COMPASS RECEIVERS

Type MN.26H.

Ideal receiver for use in small craft or fishing vessels. 12v input. Frequency range 200 to 410 Kcs; 550 to 1500 Kcs; 2.9 to 6 Mcs. Complete with 12 valves and genemotor. Valve line-up: 2—6J5, 2—6B8, 2—6N7, 1—6L7, 1—6F6, 4—6K7.

£24/17/6

A.T.5. TRANSMITTER

High Power Unit, using two 807 Valves. Covering 140 Kcs to 20 megs, with provision for six crystals and V.F.O. **£9/17/6**

Junction Box and Cables, **£5/-/-**

Aerial Coupling Unit, **£3/10/-**

BURKE GENERATORS

American Type GN-35.

Hand cranked, complete with handles and operating stand, also automatic cut-out. Output 10v at 1.25 amps; 400 volts at .07 amps. These Generators can also be used to operate as 6 or 12 volt electric motors, without alteration. Final drive through reduction gear is approx. 200 r.p.m., drawing 5 amps approx. Ideally suitable as driving motor in trawling in small boats, on rivers or lakes, duck shooting, etc.

£2/10/-

A.W.A. TRANSMITTING CONDENSERS

25 mmfd. to 375 mmfd.

15/6

TRANSMITTER TUNING UNITS

Type TU.10B
10,000 to 12,500 Kcs. £2/10/0
Type TU.9B.
7700 to 10,000 Kcs. £2/10/0
Type TU.26B.
200 to 500 Kcs. .. £2/10/0
Type TU.6B.
3000 to 4000 Kcs. .. £3/10/0

TELEPHONE RELAY PANELS

Brand new in wooden transit box. Panel contains full wave copper oxide rectifier, two phone jacks, one relay and one bayonet contact lamp holder and bezel.
Post Free all States.

12/6

MAGNAVOX

Two-valve, inter-phone amplifiers. Complete with filter, choke and output transformer.

£2/10/0

U.H.F. MIDGET HOMING RECEIVERS

Frequency range 234 to 258 mcs. Can be operated from either 12 or 24 volt internal changeover switch. Manually tuned dials. Calibrated in frequency.

£4/19/6.

MARCONI COMMUNICATIONS RECEIVERS

10 valves aircraft receiver 5 bands, frequency ranges 18.5 to 7.5 Mcs; 7.5 to 3 Mcs; 1500 to 600 Kcs; 500 to 250 Kcs; 200 to 75 Kcs. Easily converted to operate from 240v A.C. Dual ratio dial calibrated for all bands.

£45/-/-

TRANSMITTERS

Type GO9.

VFO Control. Frequency 3—18.1 Mcs; 300—600 Kcs. All switches and condensers, coils and valve sockets are mounted in porcelain. All controls can be locked. Two RF Output meters 0—9 amp; two 0—100 Ma Meters for quick current reading and one 0—15 Ma Meter. Unit relay control. Power output 100 watts.
Valve line-up as follows:—

Intermediate Frequency Transmitter.
1 Type—801 Master Oscillator.
1 Type—807 Intermediate Amplifier.
1 Type—803 Power Amplifier.

High Frequency Transmitter.
1 Type—837 Master Oscillator.
1 Type—837 Intermediate Amplifier or Frequency Doubler.
1 Type—803 Power Amplifier.

Rectifier Unit.
1 Type—5z3 low voltage Rectifier.
2 Type—1616 high voltage Rectifier.

Brand new £37/10/-

OXYGEN CYLINDERS

Suitable for conversion to air cylinders for underwater swimmers. Weight 6¼lb. Dimensions of cylinder 23in x 5-5/8in, overall 29in. Complete with 0-500lb square inch pressure gauge. Capacity 500 cubic inches.

£2/10/-

Postage & Packing 8/-.
Interstate 10/6.

Smaller model. Dimensions of cylinder 7¼in x 5in, overall 13¼in. Also complete with 0-500lb per square inch pressure gauge. Capacity 114 cubic inches.

35/-

Postage & Packing 5/-.
Interstate 6/-.

TRANSCEIVERS

Type ATR.2B

Crystal controlled and M.O. 12w output 3-7 megs. All Standard valves. Can be converted to other frequencies.

£47/10/-

GENEMOTORS

Type DA-3A, input 28v. 10.5 amp; output 300v. 260 mA, 150v. 10 mA, 14.5v. 5 amp.

29/6

Type 31, input 18v. 12 amp; output 7.2v. 13 amp, 225v. 110 mA.

39/6

Either of these models can be converted without rewiring to operate fractional H.P. motors on 240v. AC.

RADAR RECEIVERS

Type CPR.46 AAT.

Containing Valves:
1—955, 3—956, 4—6AC7, and 24v Switching Motor.
1—6AG7, 1—83V, 1—2X2, and 24v. Switching Motor.

£6/19/6

I.F. Transformer Strip

Frequency 18 mcs. Ideally suitable for use with television. Containing five EF.50, one EA.50 one 6SN7GT Valves.

£7/10/-

Postage and Packing, 8/-.
Interstate, 10/6.

Transmitter Units V.H.F.

Containing single-hand Polystyrene 6-position rotary coil turret, two VR.135 Valves and one 2050 Thyratron Valve.

£5

Postage and Packing, 5/6;
Interstate, 7/-.

Receiver Units V.H.F.

Containing double-bank Polystyrene 6-position rotary coil turret, two EF.50 and two RL.18 Valves.

£5

Postage and Packing, 5/6.
Interstate, 7/-.

NOTHING BUT TAPE RECORDERS

Buy one now at Magnetic Sound from

We sell to the public and trade only the very best on the Australian market and our long experience in this type of equipment is your safeguard when buying a Tape Recorder. We will not "push" any one type but advise on merits, application and quality. Then, when you decide to buy a Tape Recorder, you may buy it for cash or on a low deposit. All recorders advertised are from reputable manufacturers and covered by reliable guarantee.

£10

Deposit & Easy payments

See these and others right IN town at Magnetic Sound.

DEPOSIT

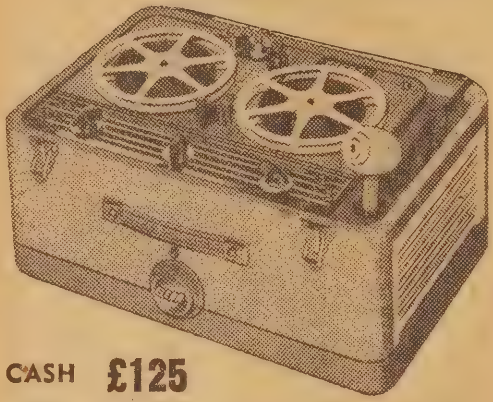
£25

World's finest with exclusive

PUSH-BUTTON CONTROL

GRUNDIG *"Reporter"*

You can now see and hear this amazing new Grundig at Sydney's Tape Recorder Specialist. The touch of a button gives mastery of perfect recording and reproduction, two hours of recorded music or speech on every reel, two speeds, twin tracks, unique condenser microphone, special speaker. Ideal for dictation, too. Cash price 150 guineas.



CASH £125

Standard Model

"ELCON" TAPE RECORDER, deposit £17/10/-

The latest model two-speed, fast forward "Elcon" that is truly top value at £125. "Elcon" RADIO-CORDER is similar, with built-in 7-valve radio as well as full recording unit and features. Yours for £20 deposit.

£15 deposit. **TWIN TRACK**

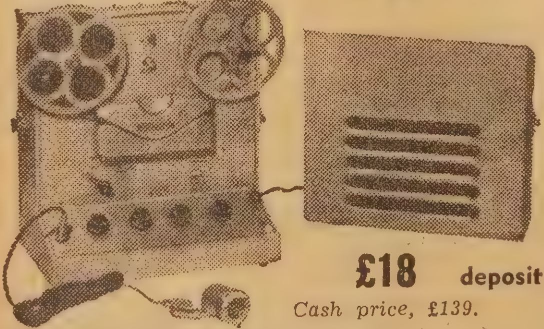
SAPPHIRE, £138/10/-

A really super Tape Recorder with separate bass and treble, 2 hours' recording on twin tracks, two speeds, two heads, electro-dynamic braking and take-up. Fast forward and rewind. Three motors used to overcome mechanical complications.

"Nothing but Tape Recorders"

Magnetic Sound

Industries (AUST.), SYDNEY.



£18 deposit

Cash price, £139.

MOVIE TAPE "TECHNICORDA"

For real home talkies Technicorda links directly with any 16, 8 or 9.5 mm. projector for perfect sound synchronisation. The speaker separates from carrying case as shown above and will operate as an inbuilt public address system also. Two hours' recording on one reel.

KITSET

Exclusive Elmec 1954 Release, £34/10/-. Comprises 2 twin track heads, dual speed, oscillator coil, Hoover motor, balanced fly wheel. All parts beautifully made, simple to assemble at home with screwdriver and pliers. Fully guaranteed. Full kit, £34/10/-.

"ELMEC" DE-LUXE DECK

1954 release, ready made and tested with twin track heads, 3¾in and 7½in speeds, 2 motors, fast forward and rewind. £43/10/- or £8 dep. and terms.

Flywheels, 2-speed, balanced and ground	£3	19	6
Pinch wheels		10	6
Reel holders, ¼ or 3-16in shaft . Each		12	6
Osc. Coils and Circuit .. .		18	6
HEADS—ELMEC, twin track, dual gap	£4	17	6
M.S.I., twin track, adjustable guide clip, 50-8500 cps. ..	£5	9	9

RECORDING TAPE

SCOTCH BOY	
1200ft. ..	£3/10/-
600ft. ...	£2/2/6
B.A.S.F.	
1200ft. ..	£3/12/6
600ft. ...	£2/5/-
E.M.I. ..	£2/18/-
AGFA	
1200ft. ..	£3/12/6
600ft. ...	£2/5/-
SPOOLS	
7in. Plastic,	10/6
5in. Plastic,	9/6
7in. Metal,	10/6
5in. Metal,	8/6

MAGNETIC SOUND INDUSTRIES (Aust.)

New and only Address **385 GEORGE ST. OPPOSITE STRAND ARCADE**

TAKE LIFT TO LOWER GRD. FLR. **OPEN SATURDAY MORNINGS 9-12 BX4440 BX4440**

TRADE REVIEWS AND RELEASES

NEW SERIES OF AMPLIFIERS RELEASED BY A.W.A.

Catering for a wide range of public address requirements, Amalgamated Wireless (A'sia) Ltd. have recently released a complete new line of amplifiers, and accessories to go with them.

THE amplifiers have power ratings of 15, 30 and 70 watts, the 30-watt unit being shown on the right. They can be used for table-top installations or equipped with alternative covers and brackets for regular rack mounting.

Input circuits are provided on all three amplifiers for (1) high impedance microphone; (2) low impedance or high impedance pickup, with optional bass boost; and (3) for a radio tuner.

Reading from left to right, the controls are: Mic Vol, Phono-Radio Vol, Phono-Radio Tone, Phono-Radio switch, Mic H.F. switch, System L.F. switch, and Monitor On-Off.

All three of the amplifiers have been designed on the assumption that they will be used with 600-ohm speakers. The 15-watt amplifier has output tappings for up to 15 such speakers, the 30-watt amplifier has tappings for 2-30 speakers, while the 60-watt unit allows for between 4 and 70 speakers.

According to the maker's figures, the amplifiers have ample sensitivity on all input channels to ensure satisfactory operation with microphones, pickups and tuners likely to be used with them. The overall frequency response from any input to the output circuit is within 1.5 db plus or minus, from 50 to 10,000 cps.

The amplifiers use either two type KT66 output valves in the case of the smaller units or four in the 70-watt amplifier.

The 30-watt AWA amplifier with radio tuner in position. The tuner is one of a number of optional accessories.

Equipment designed for use with the amplifiers includes a radio tuner, which derives its power from the main supply and mounts on to the main chassis in the position shown by the photograph. A neat edge-lit dial is employed, carrying the usual station calibrations.

Other accessories available include a slide-action record player compartment, carrying either an automatic 3-speed changer or a 3-speed player as required. A record storage cabinet is available and also a loudspeaker switching unit.

This latter takes its output from the main amplifier chassis and thereafter allows an operator readily to feed the signals to up to 5, up to 12, up to 18 or up to 25 separate speaker lines.

Further information may be obtained direct from AWA at 47 York St., Sydney.

EXTENSION SPEAKER FROM Q-PLUS

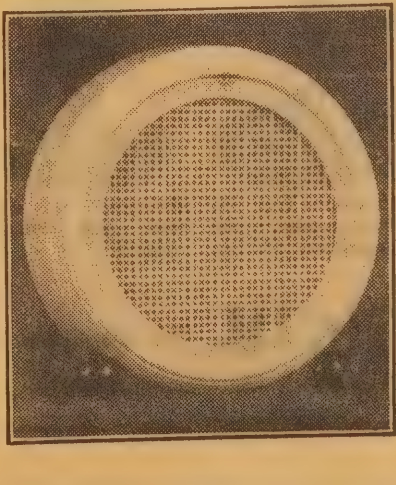
Listeners who may wish to hear their radio to better advantage in the kitchen or laundry will be interested in a small extension speaker unit recently released by Q-Plus.

INTENDED to be neat and compact, the housing is just large enough to take the 5-inch Rola speaker, which it fitted into it.

The housing itself is of moulded bakelite which can be supplied in cream or other colors. A neat moulded grille protects the speaker cone, and two spherical moulded feet allow the unit to stand on a shelf.

Alternatively, it may be hung on a partition by means of a clip fitted to the rear of the housing. A terminal block is also provided at the rear to allow the speaker to connect readily to the voice coil circuit of an existing receiver.

Supplies of the extension speaker will be available through most radio trade houses.



NEW MINIATURE NEON LAMPS

ANTICIPATING a need for unmounted neon lamps for Geiger counters, photoflash units, tape recorders and other such equipment, Messrs. W. J. McLellan have recently added such a unit to their existing Lumolite range.

Known as type FP/70, the new lamp has a nominal working voltage of 70 volts AC. It is supplied without a series resistor, however, and must be suitably protected in use against excessive currents upon ionisation.

Available through normal trade houses, the FP/70 will retail at 3/9.

FROM THE BIRTHPLACE OF MARCONI!

we proudly bring you a complete range of

GELOSO MICROPHONES AND INSERTS . . .

at incredibly low prices !

No name stands higher in the world of radio than that of Geloso of Milan, Italy — a vast organisation employing thousands of skilled technicians. Geloso equipment is standard in the Italian Navy and Air Force and is specified by many other airlines and shipping companies throughout the world.

A best seller in USA, Geloso made equipment is destined for the same success here, for the simple reason that for appearance, finish, performance, fidelity and price, it is unbeatable.

Features: Each microphone is provided with a low capacity shielded polythene covered cable ensuring minimum losses of power transfer.

Beautifully chrome plated finish.

Fully screened against RF pick-up.

Amazingly low prices.

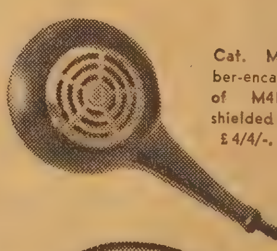
Available from ample Australian stocks, through all leading radio trade houses.

Illustrated literature is freely available to manufacturers, wholesalers, PA system operators, home recording enthusiasts, amateurs and other interested parties on request to the Sole Australian marketers:

Available from all Radio Distributors throughout Australia.

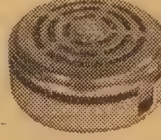
Qld. Agent: C. A. PEARCE & CO. PTY. LTD., 52 Bowen Street, Brisbane. B5860—B7161

Cat. T30: Hand or desk microphone, fully shielded, 4ft cable, £3/12/-.

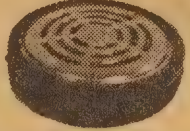


Cat. M411: Rubber-encased version of M410 with shielded cable, £4/4/-.

Cat. UNIO: Primary Geloso Piezo-electric insert, £1/10/7.



Cat. M410: As M409 but with highly plated R.F. shield, £1/18/6.



Cat. 409: For use as insert or microphone; plated front grill, £1/12/11.

Cat. 401: "Ball" type, stand mounted, crystal microphone, £6/16/1.

Cat. 401/V: Cat. 401 with volume control, £7/16/2.

Cat. B/80/1100/V: Swivel cage crystal type, stand mounted, with volume control, £8/19/5.

Cat. B/80/416: Double ribbon microphone with line transformer, stand mounted, £17/4/6.

R. H. Cunningham Pty. Ltd. 118 Wattletree Road, Armadale, Vic., UY6274
3 Cambridge Road, Drummoyne, N.S.W., WA1615

RESLO RIBBON MICROPHONE

A new microphone announced by AWA will be of special interest to those concerned with sound reinforcement of high quality public address.

IT is a Reslo high impedance ribbon type, suitable for direct connection to the input of ordinary public address type amplifiers.

The output transformer is housed within the case.

The manufacturers claim high sensitivity and a freedom from peaks, making it ideal for stage use, where quality and freedom from feedback are both important factors.

The microphone may be used vertically, as shown, or tilted through 90 degrees to allow for full circle pickup. Although the case is open, sufficient internal protection is provided to prevent the ribbon being damaged by blast.

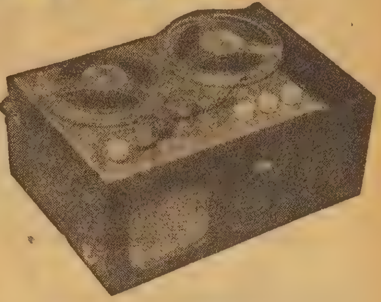
List price is £19/9/9 and supplies are available immediately.

ACOS PICKUPS

AMPLION (A'sia) Pty. Ltd., have drawn our attention to a point which may possibly confuse Radio and Hobbies' readers.

Overseas magazines have carried advertisements which suggest that the HGP-40 pickup has been withdrawn from sale. Amplion point out that this applies to an early type arm which was never released in Australia.

As sold locally, the HGP-40 pickup comprises an arm identical with the original GP-20 arm and two HGP-39 heads, to suit standard and microgroove recordings. Anyone having the original GP-20 arm can, therefore, virtually provide himself with a current model HGP-40 pickup by buying the new high compliance heads.



NOVA

'NOVA'

KITSETS---

DECKS---

HEADS---

TAPE RECORDERS---

Excellent musical reproduction at 3¾in/sec (up to 5500c/s) and at 1 7/8in/sec (up to 3500c/s) which will give up to

4 HOURS on 1200ft TAPE

THE TYPE 54 'NOVATAPE' HEAD with the 'microscopic' .00025 inch gap, only ¾in dia. with MU-METAL Shield.

½ TRACK RECORD & ERASE STANDARD HEADS £4/19/6

MU-METAL SHIELD 4/6 extra

NEW RELEASE —

Special **magnetic heads** in miniature with film guide **for 8, 9 and 16mm Film.**

REMEMBER:—'NOVA' is the **ONLY** firm making **commercial** tape-equipment, used in recorders and Tape-grams available in Kitform.

TELEPHONE AMPLIFIER

(as per R. & H. Feb., 1954)

Parts, Kitset and completely assembled.

COIL:—MU METAL STRIP, COILS, CASE 19/-. COMPLETELY BUILT-UP, 27/6. RELAY SWITCH, 14/6. ATTRACTIVE SHEET-METAL CASE, NEW SMALL DESIGN £2/15/-.

The NEW LOW VOLTAGE

PHOTOFLASH

described in R. & H. APRIL-MAY

Case, Condenser, Sieflash Tubes, Batteries, Trigger Transformer, Double Anodized Reflector, Neon etc. Operation from DRY BATTERIES, MAINS OR 4V ACCUMULATOR. Available separately, in complete kitform, or built-up.

TRANSFORMERS

From Little Hearing-Aid Transformers to the ORIGINAL 'WILLIAMSON' or 'LEAK' or English, 28A Supersilcor.

NO JOB TOO SMALL! NO JOB TOO LARGE!

All types of transformers to our customer's specifications, or VARIABLE TRANSFORMERS, RE-WINDS

Terms on low deposits

For further details contact your dealer or

'Nova'

311 SUSSEX ST.,
SYDNEY
M2159 M2350
OPEN SAT. MORN. & WEEKDAY NIGHTS.

CUT OUT HERE 5/54

Please send without further obligation,

details of ....

NAME ....

ADDRESS ....

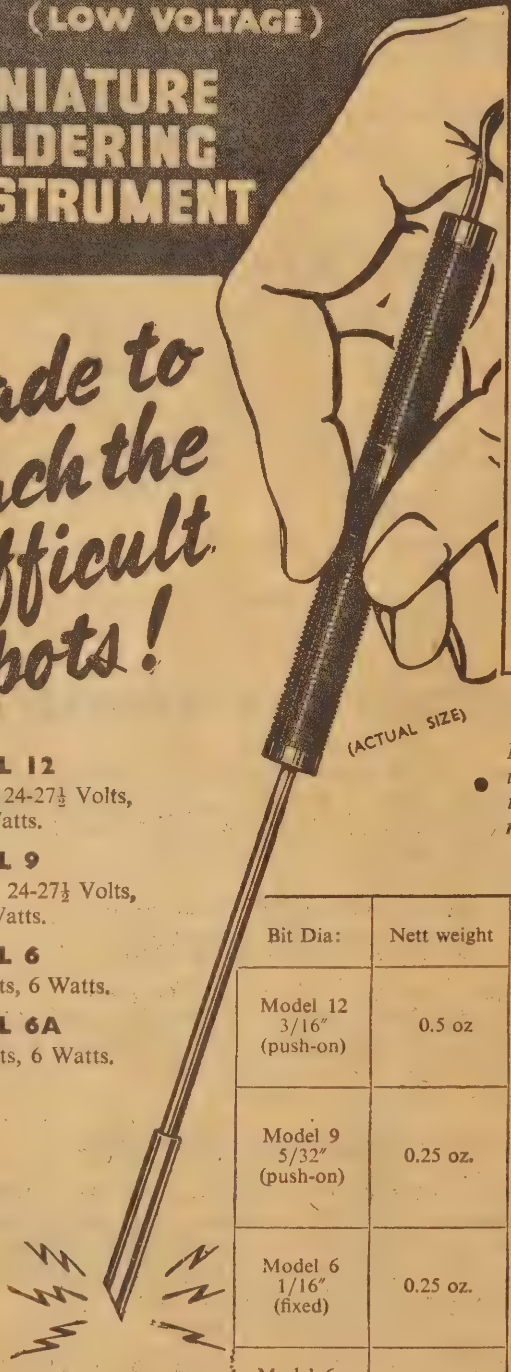
....

I enclose LARGE self-addressed envelope and 6d in stamps.

ORYX

(LOW VOLTAGE)

MINIATURE SOLDERING INSTRUMENT



Get right down to the job !

Here, at last, is an amazingly light-weight soldering instrument with which the operator can reach INSTANTLY even the most awkward spots in assemblies. There's no delay, no fumbling and no trouble with the ORYX MINATURE SOLDERING INSTRUMENT. It weighs only ½ oz., yet is robustly constructed for long life. It operates on low-voltage; thus is completely safe. There are no ceramic formers to break, no mica to flake. The ORYX accommodates interchangeable bits and is available in four models.

Made to reach the difficult spots!

MODEL 12
6, 12, 24-27½ Volts,
12 Watts.

MODEL 9
6, 12, 24-27½ Volts,
8.3 Watts.

MODEL 6
6 Volts, 6 Watts.

MODEL 6A
6 Volts, 6 Watts.

- *NINETY PER CENT of Instrument Makers in Britain use the ORYX. Cut down time and expense by using the ORYX in YOUR laboratory or assembly department.*

Bit Dia:	Nett weight	Length	Recommended use
Model 12 3/16″ (push-on)	0.5 oz	6.25″	RADAR, RADIO, TELEVISION and TELECOMMUNICATION ASSEMBLIES. (An outstanding low voltage low wattage triumph!)
Model 9 5/32″ (push-on)	0.25 oz.	6″	Hearing Aids, Midget Radios, Personal Receivers, Radio and T/V Sub-Assemblies, Coils, Electronics, Instruments, Model Construction, Electro-Medical, etc.
Model 6 1/16″ (fixed)	0.25 oz.	6″	Electrical Measuring Instrument Fine Assemblies, Hairsprings, R.F., Pick-up, Speech Coils, Hearing Aid Sub-assemblies, etc.
Model 6a 3/32″ (push-on)	0.25 oz.	6″	As for Model 6 (for extremely delicate work only)

Australian Agents:

Manufacturers Special Products Pty. Ltd.

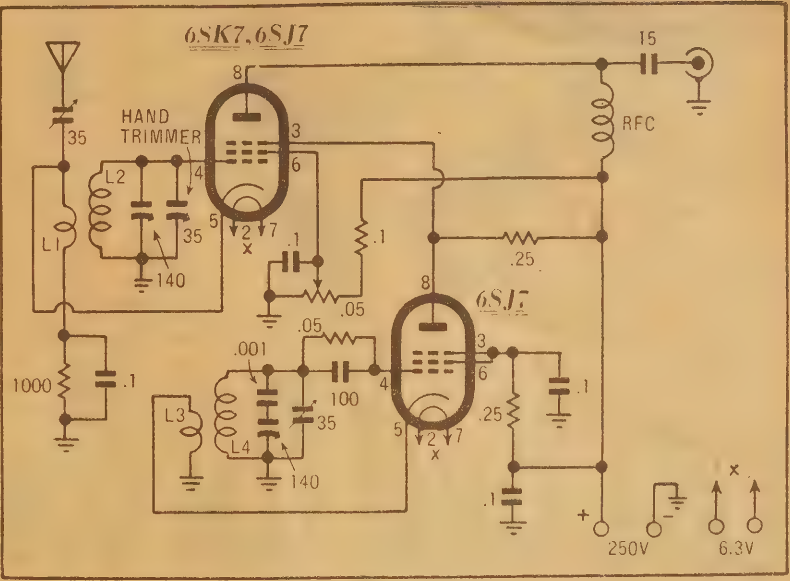
47 YORK STREET, SYDNEY— Phone: B0233

A READER BUILT IT!

Gadgets and circuits which we have not actually tried out, but published for the general interest of beginners and experimenters.

SHORT-WAVE CONVERTER FOR DISPOSALS RECEIVER

Here is an idea for "Disposals-minded" readers. Though designed initially for use with the BC453-B low frequency receiver, this short-wave converter could well be used with a standard broadcast receiver.



OUR contributor is Mr. A. G. Loveday of Elimbah, Queensland.

The tuning range selected was approximately 1.5 Mc to 25 Mc, the broadcast band being omitted purposely because the passband of the BC453-B receiver is insufficient to provide reasonable quality of broadcast program.

The circuit consists of a 6SJ7 electron-coupled oscillator which injects into the suppressor grid of a 6SK7, or 6SJ7, mixer. The cathode of the mixer returns to chassis through the aerial winding of the mixer grid circuit and, together with the potentiometer control of the mixer screen voltage, introduces controlled regeneration. In effect, the potentiometer will act as an RF gain control.

The mixer anode is untuned because the Command receiver input impedance is low. Increased gain may be obtained by connecting an aerial or RF coil "back-to-front" with the mixer anode feeding into the normal secondary and the primary feeding the following set.

EXTRA GAIN ?

Of course, increased gain may not be desired, it may even become an embarrassment. It will depend upon the sensitivity of the set into which the converter feeds.

The tuning ranges are changed by plugging in a different set of coils, the data for which are given in the table. This method is constructionally more simple than mounting all coils in the set and making the selection with a switch.

As can be seen from the circuit diagram, windings L1 and L2 are on the same former, as are L3 and L4. Winding L2 is tuned by one section of a 2-section gang tuning capacitor and together with the hand trimmer, forms the mixer grid circuit.

Windings L3 and L4 form the oscillator coil, L3 being tuned by the other section of the gang and an adjustable trimmer. The .001 mfd padding capacitor places the oscillator tuning on the high frequency side of the mixer grid tuning by an amount equal to the intermediate frequency.

A hand trimmer is used across L2 to allow the circuits to be kept in alignment throughout the tuning range. This avoids tedious trimming of the number of turns on the coils in the initial stages to keep the circuits in track.

Our contributor mounted the four oscillator trimmers, one for each range, under the chassis to be connected into circuit by a low-capacity switch to suit the appropriate coils. A simpler way would be to mount a trimmer inside the former of each oscillator coil, connecting it across the L4 winding.

When winding the coils, lay the turns of each pair in the same direction. Remember that L1 and L4 windings must have the correct phase relationship for the oscillator to function. If it does not work with the coil connected one way, simply reverse the connections to one of the windings.

METER TEST

Alternatively, you can quickly check the oscillator circuit with a multimeter by disconnecting the .05 megohm resistor from the coil side of the 100 pf oscillator grid capacitor and connecting it to chassis through the multimeter set to read on the 0 to 1 mA range. The meter will read if the oscillator is functioning. Reconnect the resistor after the check.

The coil data are for an intermediate frequency of about 455 Kc. This is within the tuning range (190 to 550 Kc) of the BC453-B Command receiver.

You could, of course, use an intermediate frequency which falls toward the low frequency end of the dial on a domestic broadcast receiver, say, between 550 Kc and 600 Kc. The mixer circuit hand trimmer should be able to take care of this relatively small change in IF. The tuning ranges will drop about 100 Kc lower in frequency, but this is negligible.

COIL DATA

Range No.	Gauge B & S	L1	L2	Winding Length	L3	L4	Winding Length
1	28	12 turns	53 turns	1⅜in	12 turns	42 turns	1⅛in
2	26	5 turns	25 turns	1⅛in	9 turns	22 turns	1in
3	22	6 turns	14 turns	1⅜in	8 turns	13 turns	1¼in
4	20	4 turns	6 turns	1in	4 turns	6 turns	1⅛in

All coils wound with enamel-covered B & S wire on 1¼in dia. formers. Windings on L1 and L3 are closewound. Spacing between primary and secondary windings is ⅛in in all cases.

Let's Buy An Argument

Progress is often difficult, often costly, often disturbing to one's peace of mind. Obviously, however it must work to our ultimate benefit or it isn't really progress. With such words, let me re-introduce the familiar problem of the budding "audiophile"—to borrow an overseas term—someone with an awakening interest in high fidelity.

ALL that I'm likely to say here has been said before at various times and in various places. It needs to be repeated at intervals, however, because there is a constant influx of new recruits to the ranks of the "higher fidelity" fans.

In their progress from ordinary individuals to people who live, eat and sleep with "higher fidelity", they encounter more or less routine problems and setbacks; moments of exhilaration and moments of blank despair.

REMARKS MAY HELP

If by talking about their problems we can bring things into better perspective, then our effort will have served a useful purpose.

I have had in my drawer for some time the letter you see on the opposite page, merely waiting for a favorable opportunity to reply. It isn't the only letter or inquiry by a long chalk but it is quite typical. It will let you see first-hand the difficulties of someone who has to buy things more or less blindly.

by Neville Williams

Then only yesterday I had a long chat with an instrumentalist in a Sydney orchestra. His story was much the same. He had heard better reproduction than his own commercial radiogram could give and he wanted something approaching that quality in his own home.

He had spent some money making changes to his set—or rather having them made—but was still not happy. Lacking any real knowledge of radio theory, he knew he wanted something better but simply could not pick hi way through the maze of advertised claims and counter-claims.

Where could he turn for guidance?

This, as I suggested earlier, is a very familiar problem.

It frequently begins with someone who has built up over the past years a goodly collection of classical or semi-classical 78 rpm records; someone who has taken good care of them and played them on a conventional 78 rpm set-up.

The standard of reproduction has corresponded broadly with that from the local stations. He has become used to the sound of it, used to the character of his records and it has fitted him comfortably, like an old coat.

NEW IDEAS

Into this happy, well-organised atmosphere has suddenly come talk of better quality pickups and speakers and, of course, microgroove records.

Sooner or later our typical subject hears some of this equipment and realises that there are sounds on his old records that he never knew were there. Further, that records are now available that leave his for dead in the matter of clarity and "tone".

He decides that he must have this improved reproduction and, unless he can draw on a lot of experience or a lot of good advice his trouble begins just there!

The man I interviewed had enlisted the aid of a serviceman and had his original heavy pickup replaced with a good quality lightweight magnetic. A preamplifier stage had apparently been added to provide both extra lift and bass boost. So far so good.

Then, to allow for playing microgrooves, the original 78 rpm motor had been replaced by an ordinary rim-driven unit, which was one of the cheap varieties, but expensive enough for all that!

Having ventured thus far, a Rola 120X speaker was then installed in an effort to get better overall response. At that juncture funds presumably ran out and the owner settled back to enjoy the fruits of his investment.

BETTER, BUT!

As you might have guessed by the tone of the tale his cup of satisfaction was by no means full. To be sure, he could hear frequencies that were completely lacking before. The equipment had better clarity and definition. In some respects it was nearer the mark.

But the pitch was suspect and, being a professional musician, he was very much aware of it. In other words the motor speed was uncertain and the unit was mechanically noisy into the bargain.

"Shouldn't the motor be at least as good as his old one in this respect?" That question puzzled him.

One doesn't need to be a mechanical genius to realise that the provision of alternative speeds isn't a simple matter. Nor is it as easy to avoid wow at 33 rpm as it is at 78.

"But should they allow motors to be sold that aren't 100 pc?"

He was just at this stage when he faced me with the questions:

(1) Had he been "gypped"?

(2) Was he just unlucky?

(3) Should he cut the losses and buy another motor that was a little dearer than the one recently installed?

And that, with variations, is a position which most budding hi-fi enthusiasts arrive at somewhere in their career. Having spent so much money and got only partial satisfaction, they call a halt and ask "Where do I go from here?"

WHAT TO DO?

Have they been gypped because a particular component falls short of their expectations? It doesn't automatically follow.

Since we have been talking about motors let's examine the position a little more closely.

There are variations in performance between different brands and between motors of the same brand, so that luck does play some part in the final result.

But, irrespective of whether you think you've paid enough or too much for a motor, the first and vital question is simply this: "Has it come from the cheapest group, the de-luxe group or from the in-betweens?"

If the answer is "from the cheapest group", then you must remember that the motor was intended primarily for use in a "keenly priced" radiogram.

The manufacturer had to cut the price to the last shilling to get orders from factories making radiograms for the masses—also cut to the last shilling. Such is the nature of modern merchandising.

If the speed of a motor finishes up a few per cent outside optimum it really won't matter to 90 pc of the users, because they are not very pitch conscious.

GOOD ENOUGH?

If it "wows" a trifle, their preoccupation with music other than piano concertos will render the fact of lesser consequence.

A few springs will generally get rid of acoustic rumble, while the modest nature of the average audio channel will prevent amplified rumble being heard to any great extent.

By and large, it's good enough. To spend time (and money) in balancing and finishing every surface would simply invite a competitor to undercut the price!

Now please don't interpret this as a wholesale defence of shoddy gramophone motors. I've seen individual examples that were shockingly noisy, shockingly irregular, prone to overheating and as many as 2 rpm out in 33!

Motors like that are bad in any language and warrant immediate replacement or a charge of sheer daylight robbery!

But the point of the matter is that you can't expect perfection from a motor that has primarily been built down to the price and down to the standard that suits the majority of your fellow men.

But perfection—or something very close to it—is what a high fidelity fan demands of the motor.

The man I am speaking of has his piano tuned very accurately and is not above checking the pitch of a recorded work against it. That doesn't leave much room for tolerance in drivewheel diameter!

He plays lots of orchestral music and is immediately aware of any variation in pitch due to wow. He has already complained of mechanical noise from the motor and will probably get upset about amplified rumble later, when he gets around to his avowed intention of buying a vented enclosure.

MY REACTIONS

That is why I answered his original questions thus:

(1) You haven't necessarily been "gypped".

(2) You may have been unlucky in getting a motor noisier than others of the same brand.

(3) Don't spend your money on another motor in the same price group in the hope that it will solve your problems. It might be a trifle better all-round than the one you now have, but it still won't be the perfect motor that you're really looking for.

Having thus said, I went on to point out what he was beginning to realise — that high fidelity isn't achieved by buying unrelated bits and pieces. It needs thought and planning. Not everybody appreciates or even likes high fidelity at first hearing.

It involves the listener, as well as mere equipment. It's a taste, an art, a science, all rolled into one. It's a process with no clearly defined finishing point.

Its pursuit demands ingenuity, application and expenditure, just like golf, orchids and travel.

TIME OR MONEY?

If our friend was determined — as he said he was—to achieve better fidelity, then his immediate and urgent need was to solve the motor problem. It would not be the end.

His need could be met in part by "working over" the present motor, correcting obvious mechanical faults, lowering the applied voltage and mounting it on a heavy, sprung board. (This procedure was detailed in the September 1951 issue and has become almost standard practice in commercial playing decks.)

By such means, the "ingenuity" I referred to earlier can make a worthwhile contribution to fidelity.

If I'm any judge at all, our musical friend will take the alternative course of waiting a while, then writ-

PROBLEMS OF HIGHER FIDELITY

This is a request to do something for people like myself who enjoy good recorded music, have little knowledge of the workings of the radios they possess, but have sufficient money to purchase or to be talked into purchasing quality equipment and end up in one —— of a mess; and have not the least idea of how to get out of it even with the help of local radio engineers!

My story is this: I have an old but excellent set. Its construction must remain a mystery to you but sufficient to say it has two 2A3's in push-pull in the output stage and gives plenty of volume, enough to fill a room 38 by 18 when used for a dance.

A Webster magnetic pickup was fitted originally and my troubles started when I changed to a GP20. I wrote you and received details of the compensating pad.

Before I could get the whistle filter coil I had gone a step further in the mad high fidelity chase and purchased a Goodmans 150 speaker and transformer. The general effect of GP20 and speaker was the "sands of time" being pushed across a board floor with hobnailed boots.

To replace the GP20 I first tried the Dual changer and found results quite good. The switch could be placed to cut off all needle scratch. I could not purchase the Dual and had to settle for a BSR changer. Results were fair but needle scratch, or I should say what I thought was needle scratch, was present on all records.

Another staggering step toward my goal—a BSR transformer as recommended by the makers—was not to be had in Australia.

To sum up I now have a BSR changer, an Axiom 150 speaker and transformer and a set that on radio gives me all the tonal qualities that I want. However, I cannot make my records sound the same. If I could, I would retire from this merry-go-round. Why should I ask your help? Because there are many in the same position as I.

What do you suggest? Something like the Universal Tone Control Unit from the March, 1949, issue which I do not possess but which is mentioned in October, 1949, issue? This should make it possible to feed into our sets the signal we want, to boost bass or treble, to be able to cut both and, above all, control needle scratch.

We are so far in now with vented enclosures etc., that a couple of extra valves, power packs and controls won't make any difference.

If this is not adequate then a 20-watt super amplifier that will enable all this stuff to be tied together into something that gives out sound like my old radio.

L.W. (Griffith, NSW).

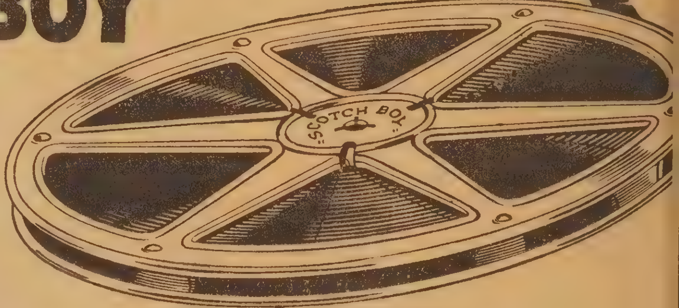
The World's best known Recording Tape

"SCOTCH BOY"

TRADE MARK

MAGNETIC RECORDING TAPE

The choice of Radio Stations
the World over!



New improved Scotch Boy Magnetic Recording Tape should be your choice, too. It lasts a lifetime, can be edited and erased, has greater sensitivity, lower noise level, and there's no tendency to stick to the recording head. In reproduction it meets the strictest demands of the world's chief radio stations.

FITS ALL TAPE RECORDERS

RETAIL PRICES
45/- per 600ft. reel
70/- per 1200ft. reel

OBTAINABLE NOW, AT

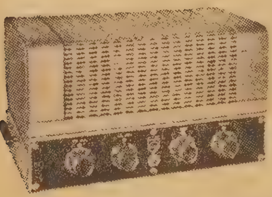
VEALLS FRIENDLY STORES

and all good radio and electrical stores

Wholesale:—Vealls Electrical & Radio Pty. Ltd.
31 Therry St., Melbourne. FJ0456

All ways a SOUND INVESTMENT!

AMPLIFIERS...

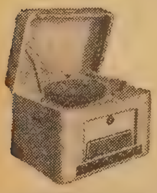


Philips' Comprehensive range of reliable Amplifiers includes:—

Item No.	963	3 Watt AC Record Player
" "	957	13Watt 240V AC
" "	974-958	13 Watt 240V AC/6V or12V DC
" "	956	30 Watt AC
" "	961	70 Watt AC

(All suitable for High Fidelity musical appreciation)

TUNER AMPLIFIERS...



The illustration at left is one of the Type 1034, which is an RF Tuner complete with 13 Watt AC Amplifier. Highly suitable for High Fidelity and as P.A. for Hotels, Hospitals, etc. Rack Mounting type Tuners also available. Outstanding features of Philips Amplifiers and Tuner Amplifiers include:

- 100 Volt matching system for output.
- Low internal resistance.

Enquire for leaflet explaining how these Amplifiers are absolutely foolproof in operation. Also, apart from having exclusive safety features incorporated, they employ a system of impedance matching which is simple in the extreme.
Also included in Philips range: Microphones, Stands, Speaker enclosures.

use...
PHILIPS
SOUND SYSTEMS

- *Less Service worries*
- *Reliability beyond question*
- *Outstanding performance*
- *Simplicity of operation!*

PHILIPS

PHILIPS ELECTRICAL INDUSTRIES
SOUND REPRODUCTION DEPARTMENT

BRISBANE, 148 Edward St. SYDNEY, 367 Kent St. MELBOURNE, 590 Bourke St.
ADELAIDE, 119 Grenfell St. PERTH, 381 Murray St.

ng a cheque for 30-odd pounds, which will buy him a motor as near to perfection as he is ever likely to need.

But, as I pointed out, the process will not stop there. For a time he will be happy but will gradually become aware that his modest amplifier cannot handle volume peaks as he might perhaps like them.

He agreed that the amplifier did seem to get "a bit fuzzy sometimes" on loud volume and the bass wasn't always in proportion.

"Still it'll do for the time being."

And it will, until such times that he begins to learn something about power output, recording characteristics, equalisation and such like.

PROBLEMS TO COME

He had a mind to buy a vented enclosure but, though representing a forward step, it wouldn't end his speaker problems. One of these days he would be tempted to discard the 120X in favor of something at two or three times the price. By then, he'll probably be able to better afford it.

I suppose there are people who can write a blank cheque and order the best of everything in one fell swoop. If there are such, they are very much in the minority. Most people's ideas and tastes and perceptions grow with their equipment and perhaps they're the happiest in the long run.

I have met many men from various walks of life, who have learned to read circuits, to build amplifiers and do their own cabinet work all as a sideline to their love of good music.

And of course there are many radio men who have come to love good music because of an early interest in audio equipment.

Very few, when they start out, have any clear idea of the time or money or effort they will invest through the years. Nor do they realise, either, the amount of instruction and pleasure they will gain in return.

But to move among them, to hear them discuss and argue about records, equipment and technicalities is to realise the truth of an earlier suggestion . . . "the pursuit of higher fidelity is an art, a taste and a science, all rolled into one".

TYPICAL CASE

Like most Radio and Hobbies readers, I haven't been able to write any blank cheque for de-luxe equipment.

I've had to work over a cheap motor till it didn't rumble or "wow" too badly.

I've filtered a GP20 pickup along lines already described till the response was substantially flat.

I've built a control unit and push-pull amplifier similar to the number 2 "Playmaster" set-up.

I've used a twin-cone Goodman's speaker and added filters to smooth out and control the top response as required.

This and similar equipment has given me many hours of pleasant listening. However, even as I write, I am conscious of an urge to lay aside other commitments and bring the equipment more up-to-date. Having done so, I suppose I'll be happy for another indefinite period.

Perhaps I should round off the discussion by commenting in brief on the particular points raised in the letter from L.W.

First of all it is obvious that L.W. has been long conditioned to enjoy reproduction that is pleasant without making any pretence to high fidelity. His original equipment indicates as much, as also does his acceptance of "radio" reproduction as a desirable standard.

Assuming the use of even a TRF tuner and the 78 r.p.m. filters commonly used by broadcast stations, this so-called "Radio" quality would probably boil down to something with low harmonic distortion but a frequency response tapering noticeably above about 5 Kc.

While L.W. gives no indication as to which one of a long line of "Webster" pickups he was using, I rather guess that its response would have been of the same order with, probably a somewhat higher distortion level.

Assuming the continued use of 78 r.p.m. records, the substitution of a GP20 pickup would thus almost certainly increase the range and brighten the response. But it would also make the record noise very much more obvious — an effect heightened by the natural resonance of the GP20 in the 6-7 Kc region.

The GP20 isn't at all peculiar in this respect, because all pickups have a treble resonance and only in the more expensive (and generally more delicate) types is it confined to a region and amplitude where it can be forgotten.

Some general purpose pickups use mechanical damping to limit the amplitude of the resonance peak but generally sacrifice the response above it in so doing. In the GP20 the peak is of such an order that it can be filtered out and still leave adequate response in the 10 Kc region.

WHY WE SAID IT

That is why we went to some trouble to explain the possibilities of the GP20 as a pickup amenable to such treatment. (See R & H for November, 1952). It is a most important point and its value would have been appreciated by L.W., had he not been quite so prompt in the purchase of a new speaker.

The purchase of the Goodman's speaker would have the probable and immediate effect of doubling the frequency range of the system, but with what result?

The additional spectrum would be occupied almost completely by record noise and distortions of one kind or another—things that were previously not audible.

It was for this very reason that we devised top-cut filters, so that enthusiasts would not have to listen to 78 records on wide range equipment. With pitifully few exceptions the records will simply not stand it and LW was finding out the truth of this.

It is a great pity that LW didn't apparently do the things we suggested —actually instal the filter and restrict the response of his new speaker for existing 78 rpm records. He might have saved himself a lot of worry.

In point of fact, he might have been much happier, for the time being, had he bought the Audiom 50, with its single curvilinear cone, rather than the more expensive twin-cone job.

The cheaper speaker hasn't the range of its big brother but it can still sound remarkably good without opening up that extreme portion of the spectrum which makes good records sound magnificent and mediocre records sound punk!

Still, he has the big speaker now and he knows what's necessary.

OTHER COMPONENTS

What of the "dual" pickup, is it better than the GP20? That would be difficult to answer, but I do think it's different. The couple of samples that I've tested show evidence of the manufacturers having applied extra mechanical damping to the stylus assembly so that the response peak does not rise so markedly above reference.

It might therefore sound smoother than the GP20 on a side-by-side test, but I'd be surprised if it responded as well to specialised filtering. And there certainly wouldn't be many highs left with the scratch button in the treble cut position as L.W. seemed to like it.

Some of the crystal pickups I've seen have been so heavily damped that they absorb not only their own peaks but most of the microgroove pre-emphasis into the bargain. Microgrooves still sound bright enough through a cheap speaker and 78s play in a comfortable, woolly sort of fashion.

An approach like that is just fine for a mass-produced radiogram but hardly the thing for someone who's jealous about his decibels.

L.W.'s preference for the "Dual" probably depends a good deal on the "treble-cut" facility. Added to this, of course, is the fact that the "Dual" outfit is in a higher-price bracket and one can rightly expect a greater degree of refinement.

WHAT WOULD I DO?

What would I do in L.W.'s position? Well, I'd look up the issues for January and April, 1950, or June or September, 1952. I'd then make up a voice-call filter so that the overall response could be limited for 78 rpm records to between 6 and 8 kc. That should make them sound less noisy and distorted. They will never produce high fidelity anyway.

I'd probably use the record changer for playing most of the 78s, but I'd also mount the GP20 somewhere and get to work with a compensation pad as outlined in the November, 1952, issue.

This wouldn't involve much expenditure.

Alternatively, I'd purchase a couple of the new HGP39 heads to fit the existing GP20 arm. The compliance has been increased and the response flattened out to just about eliminate any need for resonant filters, and this is undoubtedly a good thing.

Finally, I'd build up something like the Playmaster Number 2 Control Unit (December, 1951) and use it to compensate record characteristics and set the response to my liking.

And, after that? Well, I'd watch the record review columns, buy a few selected microgrooves and look to them for quality better than is available either from the radio or the treasured collection of 78s.

That's what I would do if I were you, LW. But since I am me I propose to get this into print and duck for cover. Already the editor has asked me whom I am working for on the side!

NEW---AMERICAN TELEPHONE WIRE

Rubber insulation with stainless steel and copper conductors supplied on metal reels each containing half-mile of wire. **£1/15/- per reel**
In case lots, each containing six reels (three miles of wire). **£10** PER CASE F.O.R.

A MOTOR WITH MANY USES

Small 24-volt motor suitable for AC or DC, reversible operation, fully laminated. Approx. one-fifteenth H.P. Size 3¾in x 2½in. ¼in Spindle. Mounting bracket supplied -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- **39/6**
Transformer suitable for above -- -- -- -- -- -- -- -- -- -- -- -- -- -- **30/-**

Postage extra.

HEAVY DUTY GENEMOTOR

Suitable for conversion to A.C. motor (approx. one-sixth H.P.). Fully laminated. Can be used as 6 or 12 volt generator at 20 or 13 amps. **£2/17/6** f.o.r.

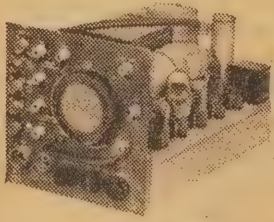
NEW H.F. RECEIVERS AND TRANSMITTER

COMPLETE WITH FOURTEEN 6.3V VALVES AND PLUGS, etc.

IDEAL FOR 144 MEG. BAND

NEW IN CARTON £4/17/6 F.O.R. GENUINE BARGAIN

PHOTOSTAT OF CIRCUIT 7/6 EXTRA



AMERICAN INDICATOR UNIT

These indicators are ideal for conversion to cathode ray oscilloscope having a built-in power supply, the power transformer only needs changing, and there is plenty of room for a time base tube etc. Supplied complete with the following valves:—
3BP1 with full length mu-metal shield, two 6SN7GT, two 6H6, one 2X2, one 6X5 and one 6G6G .. .. Freight extra. **£8/17/6**

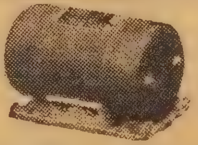
TRANSFORMER TO CONVERT THIS UNIT FOR 240 VOLT OPERATION AVAILABLE AT £3/15/- EXTRA PLUS POSTAGE

---

12 VOLT GENEMOTOR

Input 12V at 4 amp. Output 220V at 120MA. Suitable car sets, amplifiers, etc. -- -- -- -- **£3/15/-**

Postage extra



Input filter supplied with genemotors

28 VOLT GENEMOTOR

Input 28 to 32 volt at 1.5 amp. Output 250V at 100MA. Used but AS NEW -- -- -- -- **£1/15/-**

Postage extra

6-VOLT GENEMOTOR

Input 6 volt. Output 500 volt at 160 MA

£6/10/- F.O.R.

HIGH-VOLTAGE GENEMOTOR

Input 12 volt. Output 1200 volt at 200 MA.

£6/10/- F.O.R

VERNIER DIAL

American velvet vernier dial 100 to 1 calibration. Supplied with ceramic coupling **20/-**

METROPOLITAN RADIO SUPPLIES

479 Parramatta Road,
Leichhardt, N.S.W:
(At top of Taverner's Hill)
PHONE LM3610

OIL FILLED CONDENSERS

2mfd.	1800V	17/6
4mfd.	200V	4/6
8mfd.	500V	10/-
1mfd.	600V	5/-
.5mfd.	2500V	6/6
.25mfd.	3000V	6/6

Postage extra

A.R.8 RECEIVERS

AR8 Receivers made by A.W.A.. Eleven valves. Covering all frequencies from 140 K.C. to 20 M.C., valves required 3—6A8G, 4—6U7G or 6K7G, 1—6J7G, 1—6J5, 4—6B8G, 1—6X5G. (Circuit supplied.)

Price less valves and covers	£9/10/-
Less valves, covers and dials	£7/-/-

Freight extra.

A.T.5 TRANSMITTERS

AT5 Transmitter in good condition less valves. Frequency coverage 140 K.C. to 20 M.C. Valves required 3—807 and 2—6V6. (Circuit supplied).

Less valves	£5/5/-
Less valves and covers	£4/5/-

Freight extra.

A.R.7

COMMUNICATIONS

RECEIVER

These popular receivers covering from 140 KC to 25 MCS. In five bands. Feature signal strength meter, crystal gate, noise limiter, two RF and two IF stages.

Supplied complete with nine valves, five sets coils, AC/Vib power supply, speaker and mounting rack.

AIR
TESTED **£47/10/-**

HIGH-POWER I.R.C. RHEOSTATS

250 ohm, 25 watt.
10 ohm, 2½ amp; 25 ohm, 1 amp
Price, each **10/6**

50-CYCLE A.C. AMMETERS

Range 0-14 Amps.
Scale Size 4in. Dia.
Brand New.

Price, each,

45/-

Packing and postage: NSW, 3/-; Interstate, 5/6.

BUTTERFLY CONDENSERS

Capacitance range 3-35 microfarad. Size 1¼ x 2¾ x 2¼ inches. Brass plates: Ultra high frequency insulation: ¼-inch shaft.
Price, each **7/6**

Packing and postage: NSW, 1/-; Q., T. and V., 1/6; W.A., N.T., 2/-.

NEW A.W.A. VIBRATORS

6 volt A.W.A. gas filled vibrators, heavy duty, synchronous.
Price **15/-**
(Special price for quantity.)

D.C. GENERATORS

12v 750 watt. Ideal Home lighting, Battery charging, etc.
PRICE £4/10/- F.O.R.

TRICKLE-CHARGER KITS

Kits for trickle-charger as described in R. & H., June issue. Comprising transformer with 18V winding tapped at 12V-3 100mA rectifiers and 50 ohms control.
Postage: NSW, 5/-;
Interstate, 7/6. **39/6**

1143A. TRANSCEIVERS

(English equivalent to SCR 522) Frequency range 100 to 156 m/cs Complete with 20 6.3V Valves. New condition, supplied in transport case.

£12/15/- plus freight

SCR 522 GENEMOTORS

28 volt input D.C., regulated and filtered output filtered D.C. 300 volts at .26 amps; 150 volts at .01 amps; 14.5 volts at 5.0. Completely shielded in metal case, 12 x 8 x 5 inches.
Price, F.O.R. Each **55/-**

A.T.5-A.R.8 POWER SUPPLY

24 volt genemotors supply containing two genemotors, one giving 550 volt at 350 mills and the other 250 volt at 100 mills, also contains filter condensers, relays, fuse holders, etc.

£4/10/- F.O.R.

TYPE 1133 TRANSCEIVER

Freq. range 90 to 130 m/cs contains 17 6.3 volt valves.

£8/17/6

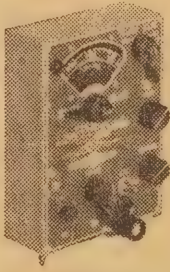
METROPOLITAN RADIO SUPPLIES

479 Parramatta Road,
Leichhardt, N.S.W.
(at top of Taverner's Hill)
PHONE LM3610

TRANSFORMER SPECIAL

H.D. Power Transformer, 265 x 265 250mA 4v Fil. Windings	£2/5/-
H.D. Power Transformer, 365 x 365 150mA 4v Fil. Windings	£2/5/-
C.R.O. Transformer, 1540v, 2v Filament Winding	£2/5/-
150mA Filter Choke	£1/2/6

Prices F.O.R.



NEW MN26 COMPASS CONTROL-BOX

37/6

6in Flexible drive for above, 10/-. 24in, 18/6.
Postage extra.

SPECIALS

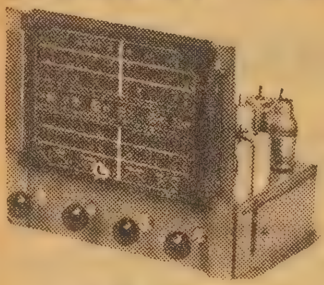
Carbon Mike Inserts	2/6
Bakelite Fuse Boxes	4/6
5-Position Push Button Switches	10/6
Carbon Mike Trans.	4/6
Double Button Carbon Mikes	7/6
Throat Mikes	5/-
Cutler Hammer Switches	2/6
Shielded Hook-up Wire, yard	8d
3 gang Standard Condenser	20/-
Twin Co-ax Cable, 20ft lengths	6/-
2 gang Condenser	16/-

NEW WESTON & FERRANTI METERS

0-.5 amp. RF thermocouple	9/6
0-3 amp. RF thermocouple	9/6
0-4 amp. RF thermocouple	9/6
0-10mA DC	17/6
0-20 volt DC	17/6
0-5 amp. DC	27/6
0-10 amp. DC	27/6
(All above are 2in flush mount.)	
0-10mA DC English Turner 3in Round Flush Mounting	30/-

Postage Extra.

NEW FIVE VALVE DUAL WAVE RADIOGRAM-CHASSIS



£17/17/6
PACKING and FREIGHT EXTRA

FULLY GUARANTEED

These chassis give excellent local, interstate and overseas reception, and are fitted with pick-up terminals and radiogram switch. On-off switch is fitted to enable power to be switched off from set.

Supplied tested and complete in every detail with five standard valves, 6J8G, 6SK7G, 6SQ7G, 6V6G, 6X5G, and 12in Rola or Magnavox speaker.

SHOP-SOILED—3-SPEED—RECORD CHANGERS

COLLARO 3/511 and 3/521 3-SPEED CHANGER

With lightweight, high fidelity twin crystal heads.

£11/10/-
FREIGHT EXTRA

STROMBERG CARLSON VELVET-ACTION 3-SPEED CHANGER

With turn-over crystal pick-up.

£15/17/6
FREIGHT EXTRA

PLESSEY 3-SPEED MIXER RECORD CHANGER

With high fidelity crystal pick-up dual stylis.

£11/17/6
FREIGHT EXTRA

NEW PHILIPS MICROGROOVE RECORD PLAYER

Philips and Mullard two-speed (78 and 33 rpm) microgroove record players. These units are fitted with a high fidelity turn-over crystal pick-up and automatic stop.

£5/19/6 Postage NSW 8/-; Interstate 12/-. (extra).

Portable leatherette cabinet suitable for above	£3/15/-
Cabinet suitable for record changer	£5/10/-

Synchronous motor and drive in this unit is ideal for tape recorders.

NEW COLLARO SINGLE-SPEED RECORD PLAYERS

Type AC54 single-speed record player with high-fidelity head and automatic stop. For 240 Volts AC operation.

Special Price
£3/5/0
PLUS POSTAGE
Interstate 8/6, NSW 5/

ROTHERMEL SAPPHIRE NEEDLE PLAYS 2000 RECORDINGS, 5/6

CRYSTAL PICK-UP CARTRIDGES
Rothermel high fidelity pick-up cartridges, replacement for most pick-ups.

METROPOLITAN RADIO SUPPLIES

479 Parramatta Rd., Leichhardt, N.S.W.
(At top of Taverner's Hill)
PHONE LM3610

NEW — SPEAKERS — AT — HALF — PRICE

6in SPEAKERS

HEAVY-DUTY PERMAGNETIC WITH 15,000 OHM TRANSFORMER **29/-**

POSTAGE AND PACKING

	NSW	Interstate
12in SPEAKERS	7/6	12/6
8in SPEAKERS	5/6	9/6
6in SPEAKERS	5/-	8/6
TRANSFORMERS	1/6	

12in SPEAKERS

HEAVY-DUTY PERMAGNETIC WITH 5000 OR 10,000 C. T. TRANSFORMER **54/-**

WITH 15,000 OR 20,000 TRANSFORMER 50/-

Separate Transformers to suit any of above speakers—5000 ohm 8/6 each (Supplied with speakers only)

NEW—DYNAMIC—SPEAKERS

New 7in dynamic speaker by leading manufacturer 1500 ohm field coil, 7000 ohm transformer — — — **27/6**

New ovaltone dynamic speakers 9in by 6in 1,000 ohm field and 5000 or 7000 ohm transformer — — — **27/6**

SPECIAL PRICE FOR QUANTITY

Postage N.S.W. 3/6.
Interstate 5/6

POSTAGE AS ABOVE

NEW VALVES IN CARTONS
SPECIALS (Ex-Disposals)

12SH7	7/6
12A6	12/6
12SL7	12/6
12SJ7	12/6
12SK7	12/6
9001	10/-
9004	10/-
AV11	9/9
1K7G	9/6
1M5G	9/6
1C7G	11/6
1L5G	10/6
6K7G	8/6
5U7G	12/6
6SA7GT ..	12/6
6SK7GT ..	12/6
6SQ7GT ..	12/6
3S4	15/-
6C4	15/-
6AG5	15/-
1T4	15/-
VR65A	3/6
5Z3	15/-
1K5	7/6
6SH7	7/6
7193	5/-
EF50 with socket ..	11/6
6SH7 or 1K5 in dozen lot.	5/-
6J8G	17/6
6AC7	12/6
955 (acorn)	12/6
957 (acorn)	10/-
6AK5	15/-

Please add postage

New Electrolytic Condensers

12 mfd-525V **4/6** each or **48/-** dozen plus post
8 mfd-350V **2/6** each or **24/-** dozen plus post
4 mfd-600V **2/6** each or **24/-** dozen plus post
16 mfd-350V **3/-** each or **30/-** dozen plus post
10 mfd-40V **2/-** each or **21/-** dozen plus post

NEW GERMANIUM DIODES
TYPE 4A42

Ideal for use as Crystal Detectors, Noise Suppressors, etc — — — — — — — — 7/6
POST FREE

NEW COILS AND INTERMEDIATE TRANS, By A LEADING MANUFACTURER

Permatune I.F. trans. 455K.C. — — —	9/6
Aer. Permatune B.C. coils 455K.C. — —	7/6
R.F. Permatune B.C. coils 455K.C. — —	7/6
Osc. Permatune B.C. coils 455K.C. — —	7/6
Aer. Permatune S.W. coils 16-50M. — —	6/6
R.F. Permatune S.W. coils 16-50M. — —	6/6
Osc. Permatune S.W. coils 16-50M. — —	6/6

METROPOLITAN RADIO SUPPLIES

479 Parramatta Rd., Leichhardt, N.S.W.
(At top of Taverner's Hill)

PHONE LM3610

NEW VALVE SOCKETS

Teleton 8-pin octal moulded sockets **5/-** per dozen or **25/-** per 100.

American 8-pin Loctal high insulation **5/-** per dozen or **25/-** per 100.

CARBON RESISTORS

Well known make of carbon resistors in values of 100 ohms to 5 megohms. In 1-watt, ½-watt and 1/3 watt. All resistors are standard color coded and in original cartons. In lots of 100 mixed values comprising 50 1-watt, 25 ½-watt, 25 1/3-watt. .. Post, 1/6. **12/6**

IN LOTS OF 500, 50/-.

SOLDER

English multi-core solder in 1lb reels.

12/6 per lb.

Postage extra

NEW MERUCRY SWITCHES

The switch with a 1000 uses.

2/9 each

SPECIAL PURCHASE 100 NEW "PAILLARD" RECORD CHANGERS

The "Paillard" record changer has a variable speed motor making it ideal for dance halls, etc., and is fitted with a high fidelity crystal pick-up. Sapphire needle supplied with each unit.
BARGAIN PRICE **£7/18/6**

In orginal cartons — freight extra.

NYLEX HOOK-UP WIRE AT HALF PRICE

Nylex hook-up wire 10/.010 in 100 yard coils, each coil consisting of five 20 yard lengths in 5 different colours.

10/- PER 100yds. Plus postage

OFF THE RECORD — NEWS & REVIEWS

The main interest for me in the month's listening has been the inclusion of three outstandingly good recordings. They are so good that I think it will be a long time before they will be bettered as a trio of top-notchers. They have succeeded in underlining for me several important features which are part and parcel of high quality reproduction.

I'LL group them together for the purposes of review, for they have many things in common, although they come from three different studios

MOUSSORGSKY.—Pictures at an Exhibition (orchestrated by Ravel), Played by the Chicago Symphony Orchestra conducted by Rafael Kubelik. HMV OBLP 1003.

RIMSKY-KORSAKOV. — The Golden Cockerel Suite—Capriccio Espagnole Opus 34. Played by L'Orchestre de la Suisse Romande conducted by Ernest Ansermet. Decca LXT 2769.

PROKOFIEFF. — Lieutenant Kije Suite—Scythian Suite. Played by the Vienna Symphony Orchestra conducted by Herman Scherchen. Westminster WL5091.

All three are descriptive compositions—program music. The "Pictures" tells of a promenade through an exhibition of pictures and the impression each leaves with the composer.

PROGRAMME MUSIC

The "Golden Cockerel" was presented to a mythical king to warn him of danger. There are incidents on the battlefield including a beautiful queen, and the death of the stupid, aged king because he refuses to hand over the queen to the astrologer who initially presented him with the bird.

"Lt. Kije" was a non-existent Russian officer given official identity because the Tsar misread a name on a report and no one liked to tell him of his mistake. Kije's equally non-existent adventures are represented in scenes captured in the score.

Descriptive music of this kind sets a composer scratching into his imagination for telling instrumental color and effect, and as these three were masters of such things, each record is based on music ideally suited to brilliant performance.

Because of the highly original and unusual effects written into the scores, many of which would be lost unless every instrument is heard in complete clarity, balance, and range, the utmost care has been taken with microphone placement and general acoustic control.

TERRIFIC RECORDING

Add to this three of the world's most brilliant and sensitive orchestras, with conductors of equal calibre and experience, and we can't be surprised if we get something out of the ordinary.

The "Pictures" is just terrific recording without any doubt. Its realism and presence are quite amazing. The edge on the brass which the composer uses so freely, the weight of the tympani, and the definition of the tiniest contributor to the music will bring the most blase listener from his chair. Some of the attack is so good as to achieve a real sense of shock. Its reputation is completely vindicated, and wide-range fans just cannot overlook it.

In justice to Philips, whose version I commented upon favorably a month or two ago, I should say that it isn't far behind this spectacular HMV. If you have it, you needn't lose any sleep. I could easily fool you by substitution unless you were very wide-awake and knew them both well.

The "Golden Cockerel" hasn't such an impact by its very nature, for its emotional tension is lower, and its romantically beautiful color is a warm contrast to the razor-sharp outlines which dominate the other two.

BALANCED AND CLEAR

To me it is an example of near-perfection in beautiful instrumental recording. There are passages which are quite remarkable for their perfect balance and absolute clarity. Ansermet and the Suisse orchestra are unrivalled in sensitivity and flexibility. Here is the greatest skill in orchestral dynamics—a performance and recording so good that one forgets there is any mechanics involved at all. It is in every way a masterpiece.

The "Capriccio Espagnole" is probably better known to the average listener. Ansermet doesn't make this the noisy thing it has so often been in the past. The tone never hardens, the outlines never blur, he sees the music as a musician rather than a showman, and he gives us music in return. On such a basis this disc is probably the best of the three, and I would not be without it.

The opening bars of "Lt. Kije" give the key to its Grand Prix of Paris award for recording in 1953. The beautifully adjusted reverberation is illustrated by the cornet and snare-drums, which introduce the music, closely followed by brass and tympani. The effect is spatial, but crystal clear—beautiful transients and sparkling top are followed by full-bodied bass. Once again the story is balanced impact against a background of virtually complete silence.

By JOHN MOYLE

There is so much on this record that it demands the finest equipment to do it justice. Everything must be absolutely right. If it's not, you won't hear the addition of a double-bass harmonic to the snare-drums to reinforce their cavity resonance when accompanying the muted cornet at the end of the first and fifth sections, or the muted violas which heighten the brassy shiver of the cornet's last notes. Does this sound far-fetched? Well it sent me hunting for the score to confirm just what went on, after animated discussion with a couple of friends who could hear only a "distorted" bit of brass and no drums at all! I wasn't prepared for the bass harmonic, but the violas are easier to hear.

The Scythian Suite is of the same technical order.

NO MARGINS LEFT

Let me emphasise the utter importance of using only perfect pick-up styli with records like these. I started out with one which has played probably no more than 50 sides, but the blistering brass which opens the Golden Cockerel produced such a horrible noise that I was a most disappointed man until I changed it for a new one.

The same story was repeated with all three, and I am certain it accounts for bad reports I have had from others, who have been disappointed with the "Pictures".

I am not suggesting we have reached perfection in recording, pressing, or making sapphires, but I am quite convinced that there just isn't any room for doubt at the moment when we play really wide-range records recorded at high amplitude such as these.

We must face the position that there is no happy-go-lucky middle road for near perfect reproduction. We can only take comfort knowing the rich return we can get for taking extra care.

I could notice a distinct echo just before the opening brass of the Golden Cockerel. Whether this is groove distortion or tape print-through is hard to say, but both these tendencies must be watched with high amplitude recordings. It is a blemish, but doesn't detract from the record as such.

MENDELSSOHN—Symphony in A Minor Opus 56 (Scotch), played by the London Symphony Orchestra, conducted by Georg Solti. Columbia LXT2768.

This record makes an interesting comparison with the Vox version by the Vienna Symphony Orchestra recently reviewed. The first impression is that the Decca is much more heavily recorded and more forward than the Vox. Both bass and treble are more prominent; in fact, the violins tend to be a trifle overpowering in parts. It is no doubt the result of closer placing of the microphone, and the general effect is somewhat more impressive.

Solti takes the symphony at a brisker pace than Klemperer, with an unexpected exception in the second movement, where he claps on the greater speed.

By his over-all faster tempo I think he rather discounts the music, which, although written in no heroic vein, can stand a little more sympathetic exposition. Klemperer obviously thinks so, and there lies the real difference musically between the records. If you prefer a more vigorous, vivid disc, then you'll pick the Decca. I don't think you would be disappointed with either of them. The Vox has the lower surface noise.

BRAHMS—String Quartet in A Minor Opus 51 No. 2; Quartet in B flat Major Opus 67. Played by the Curtis String Quartet. Westminster WL5152.

It is something of a coincidence to receive these two Brahms quartets, which are not often heard, immediately after reviewing the third of the trio (Opus 51 No. 1) from Decca. After playing them half a dozen times it is difficult to understand why they don't appear more often, unless it is because they are so tightly written as to require intense preparation. No one can imagine even the best of performers tossing them off after a couple of rehearsals.

This is a fine record of fine music. It is hard to think of any quartets other than those of Beethoven which achieve such stature, or which so completely occupy the senses of those who hear.

As we might expect from Brahms, the players are busy all the time. The effect is frequently quite orchestral, heightened because the recordings were obviously made in a hall with appreciable reverberation.

STRENGTH AND BEAUTY

The Opus 51 I thought more easily recognisable as Brahms—the Opus 67 is much mellower as a work and with an appreciably different flavor.

It is written magnificently, with strength and beauty. It has a sense of adventure, of a journey well taken through many moods and grateful melodies, in a sure and flowing progress to a full and satisfying end. Musically, I rate this record very highly.

The recording hall adds a dimensional effect to the performance which some mightn't appreciate after the forwardness of many recent chamber music releases. It takes some of the bite from the strings and we are aware of their tone being softened by wider dispersal. I found the effect different, but not objectionable.

This is undoubtedly a fine quartet, whose ensemble can rarely be faulted and then only mildly. A slight deterioration in quality over the last few grooves of each side is the only obvious technical fault. Surface noise is low.

BEETHOVEN—Symphony No. 3 (Eroica). Played by the Philharmonia Orchestra, conducted by Herbert Von Karajan. Columbia 33CX1046.

This business of picking the "best" recording of a given work is a dangerous business, particularly as few reviewers are able to assemble all available versions at one time.

I believe there are about 15 versions of the Eroica, for instance, and even half a dozen of them would represent many hours of listening. I quite liked a Vox version reviewed recently, but many no doubt would like this one from Columbia even better. The recording is much more forward and has more bite, although the general tempo is steadier and at times less enterprising.

It still does not compare in my opinion with Toscanini's idea of it, although the maestro is so badly presented in the 8H studio that I can't prefer it on that count alone.

It's safe to say that Von Karajan's effort and that of his orchestra is likely to be a permanent contender for your money. It is a very sound effort, despite some surface noises which might in some degree be due to previous playings of the disc by others. It's not wide range—just good stock recording.

MOZART—Violin Concerto No. 4 in D major (K218); Violin Concerto No. 6 in E flat major (K268). Played by Reinhold Barchet and the Pro Musica Orchestra of Stuttgart, conducted by Wilhelm Seegelken. Festival CFR12-82.

I hope you won't be upset if I suggest that not all Mozart's music is of the first water—that some of it is only fair average quality, and even monotonously stylised at times. Surely it is inevitable that in his enormous output over a few years he must fail to equal his best form.

I think these two works illustrate that point, but in fairness it should be mentioned that the one I liked least—the E flat—was probably completed by somebody else.

The D major on the other hand is perhaps Mozart's most popular violin concerto, and contains some lovely music. It is so much the better of the two that I fear you would wear it out long before its companion on this record.

The original is by Vox, and although not brilliant, is reasonably well done. The violin tone is rather sharp, and needs a little more than usual top cut to tone it down on wide range gear. On the average radiogram it should sound quite pleasant.

General balance is good and a somewhat forward violin is more in place here than it would be in the big works of later date.

(Continued on Page 104)

JABEL
Rotary
Wafer
SWITCH

A single-bank, space-saving, wafer - type switch, only 1¼in dia. Provides switching for 1, 2, 3, or 4 circuits.

From Wholesalers Everywhere!

Watkin Wynne
Pty. Ltd.
173 Pacific Highway,
North Sydney.
Represented in all States.

"For those who can hear the difference"

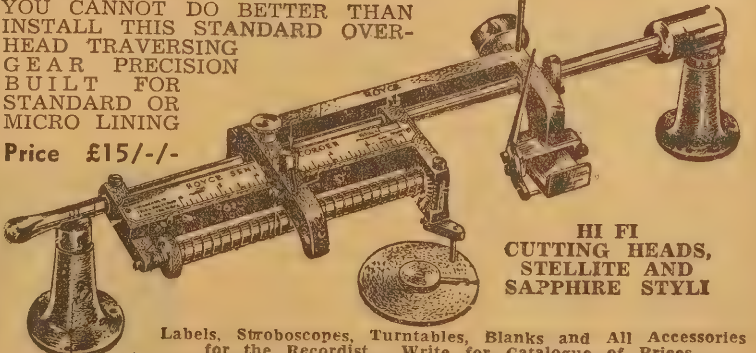
Your ear detects the subtle shading of a piano, clean brilliance of violins, the purity of a flute.

. . . yes, even the iridescence of clashing cymbals, the roundness of a clarinet, the mellowness of cellos. You can hear the difference for these are the thrilling new listening experiences released for your enjoyment by "Connoisseur".

The Connoisseur (reg.) in 3 speeds, 33 1-3, 45, and 78, full 12in turntable, is available with new lightweight pick-up (interchangeable heads).

★ Due to import restrictions deliveries are slow. But please be patient!

J. H. MAGRATH & CO. PTY. LTD.
208 Lt. Lonsdale St., Melb. FB3731.



ROYCE
PHONE FB2592.
RECORDING EQUIPMENT

FOR HOME AND STUDIO
YOU CANNOT DO BETTER THAN INSTALL THIS STANDARD OVERHEAD TRAVERSING GEAR PRECISION BUILT FOR STANDARD OR MICRO LINING

Price £15/-/-

HI FI
CUTTING HEADS,
STELLITE AND
SAPPHIRE STYLI

Labels, Stroboscopes, Turntables, Blanks and All Accessories for the Recordist. Write for Catalogue of Prices.
PLAYBACK RECORDING SUPPLIES — BOX 5041Y, G.P.O., MELB.,
SALES AND SERVICE, 291 EXHIBITION ST., MELB.
South Aust. Rep., Scott Sales, Richards Bldgs., 99 Currie St., Adelaide.

FOR BETTER PERFORMANCES

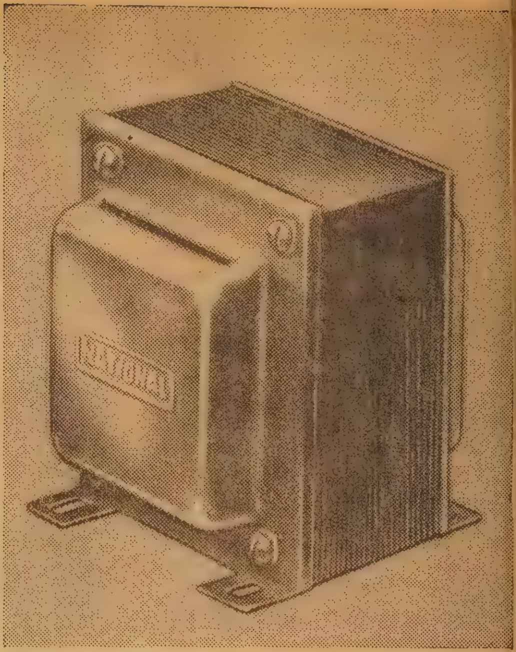
Specify

National

when next you buy

FILTER CHOKES

. . . their many quality features ensure a better overall performance.

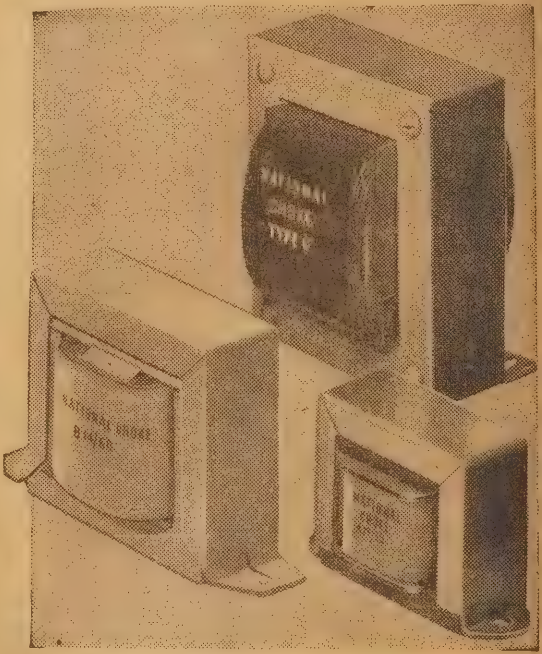


Compare these features:-

- Coil is impregnated with special varnish and baked to resist humidity.
- Latest winding technique.
- Leads specially anchored—will not pull out.
- In larger types where covers are used, cooling louvres are scientifically placed in the covers to give maximum flow of air past winding, and so minimise temperature rise.
- All Chokes are finished in the same colour scheme as Natonal Power Transformers.

Compare this range:-

TYPE	INDUCTANCE In HENRIES	mA	D.C. RESISTANCE	RETAIL PRICE
A.12/50	12	50	560	11/6
B.14/60	14	60	520	13/9
C.20/60	20	60	500	25/5
D.30/60	30	60	600	45/-
C.15/80	15	80	430	42/11
E.20/80	20	80	300	45/-
E.30/80	30	80	380	48/5
F.15/100	15	100	300	45/-
F.15/125	15	125	250	59/-
F.15/150	15	150	200	67/-



- For the utmost in performance . . . always use National Filter Chokes with National Power Transformers.

Ask your supplier for full details, or write direct to—

Australian & Overseas Agents:

Wm. J. McLELLAN & Co. Pty. Ltd.

126 SUSSEX STREET, SYDNEY, B.X1131

(50 yards north of King Street)

DISTRIBUTORS IN ALL STATES

A NATIONAL PRODUCT FOR A NATION'S NEEDS

RECORD NEWS FROM ABROAD

By DISCOBOLUS

A few months ago. English Columbia decided to release on LP the Malcolm Sargent recording of Handel's Messiah, and announced the disc for release during April.

DECCA were not slow to react to this, and NIXA also thought highly of the idea; so there are now three LP's of the work, issued within a few weeks of each other. NIXA's performance is by the London Symphony Orchestra and Hermann Scherchen (also issued in USA on Westminster), and Decca have used the original manuscript with the London Philharmonic Choir and Orchestra under Sir Adrian Boult.

HMV have inherited from RCA Victor a new way of selling operas. Their April list contains the two operas. Pagliacci and Cavalleria Rusticana, on three 12in auto-coupled discs. There is no choice in the matter — either you take the two or keep away from both. As each opera takes three sides, surely this is a case for 10in discs as the logical solution.

The remainder of the HMV releases for the month are the Rachmaninoff Symphony No. 3, the Haffner Symphony — with the London Mozart Players, Elgar's Cello Concerto, the Bruch Concerto (Heifetz), and Toscanini's recording of the Beethoven Seventh, which makes seven versions of this in England on LP. In case you think that this would be enough, let me mention that in USA there are seventeen.

NEW COLUMBIA LP

On Columbia, the first English LP has appeared of the Khachaturian Violin Concerto, played by the Russian soloist Igor Oistrakh. He is accompanied by the Philharmonia Orchestra, which on this occasion is conducted by Eugene Goossens. Columbia's new Pastoral dead-heats for first place with the recently issued Kleiber recording on Decca. The new issue is by Karajan. In the instrumental group, Gieseking continues the Mozart piano works, and Mahcuzynski plays a number of Chopin mazurkas and polonaises, with another LP devoted to works by Bach, Beethoven, and Brahms.

Apart from the Messiah referred to above, the only new Decca is Anthony Collins with the Sibelius Symphonies, No's. 4 and 7. It looks as though Decca are out to complete the set. American Mercury have already done so, with the seven symphonies played by the Stockholm Radio Orchestra, and it is rumored that these will be sold in Australia, but not necessarily on the Mercury label.

There are some 15 NIXA-released Westminster, and NIXA are trying to popularise some of them by sponsoring lunch-time recitals as soon as the records appear in London.

Philips, who have been unexpectedly late in entering the LP field in England, are about to begin, and the first release from American Columbia will include works recorded by Sir Thomas Beecham and the Royal Philharmonic. Decca and EMI will have some healthy opposition once Philips get into full swing, and the public will probably be faced with more confusion when further duplications of various works appear, as they most certainly will.

In the 45 rpm field, HMV and Columbia have, between them, issued about 30 Extended-Play records, ranging from overtures to pops and jazz. The prices are lower than for Decca Medium Play, for pieces of comparable length, and not all of the recordings are "dubbed 78's."

MOZART TRIOS

In USA, Badura-Skoda, Fournier, and Janigro are in the middle of the set of Mozart Piano Trios. The only other set has come from NIXA, via the Period Company, New York. Pursuing Period's history a little further, some of their discs have come from Austrian-recorded tapes made on behalf of the Belgian Gramola Company, who sell to Period. If any of these come our way, the label will be NIXA. This sort of thing is quite typical of the industry, where there are now, in USA about 209 labels, in France 50, and Germany 15.

American Columbia have just copied an idea brought out by one of the small independent companies about two years ago, where the LP is sold, for a limited period, complete with a 7in "LP" which discusses and illustrates the music played on the main disc. In this case, the work is the Hugo Wolf Quartet in D Minor.

Four new Eroicas arrived together last February, and the latest total is 20 versions, which is also the figure for the Nutcracker Suite.

Following the cut-price labels introduced by RCA and Columbia, other companies have followed suit, and now many LP's from the big groups are on sale at less than half the standard price for classics, which was originally set at a little under six dollars.

GLENN MILLER ALBUM

RCA are currently making a fuss over a new album containing no less than 5-12in LP's by the Glenn Miller band. The issue has been modestly advertised as available in a limited edition, but in fact the numbers have been set at 100,000 copies!

Packaging of LP's into albums is more advanced in the USA than elsewhere. RCA, for instance, have combined into one album the four Brahms symphonies by Toscanini, and also his recordings of the nine by Beethoven. Angel Records, the American outlet for EMI, now have two prices for all their records. The lower one, known as the Thrift Pack, offers the record in a plain cardboard cover, while the Package for the Perfectionist, as they call it, contains the record factory-sealed and cellophane-wrapped, with the usual notes and elaborate cover. The difference in price is one dollar.

Two new versions of well-known amplifiers have just appeared in England, both of them following the trend set by the Americans. The QUAD now has a preamplifier which corrects for four LP recording curves, apart from providing the usual Treble and Bass controls. The same sort of circuit has been incorporated in the latest model Leak, which now has an equaliser set for AES, RCA New Ortho, Columbia and Decca, NARTB (formerly NAB), and HMV. All these are LP positions, and only one is fitted for 78's.

The Vari-Slope Top-Cut Filter which has hitherto been such a feature of the Leak has been omitted.

The soundness of the general principle of equalising for different labels before balancing for personal taste with Treble and Bass controls is accepted by all the big American manufacturers, and circuits in recent issues of Audio Engineering certify the correctness of the values used in the simple switch described in my name last month.

The RADIOMASTER

RADIOGRAM CHASSIS . . .

a great performer on Radio and Records

FEATURES:—

Eight valves, world range — Push pull output—Treble and bass boost—Inverse feed-back —R.F. stage—Three position switch for radio and gramophone—Switchpot for volume and power supply—Latest type high gain valves—Straight line edge lit dial in four colours—Moulded escutcheon plate, size 12½in x 7in — 12in speaker, choice of Rola, Jensen or Magnavox—Six months' guarantee—Chassis size: 13in x 8in x 9in high.

Price £32/10/-

Freight extra.

Cocktail and Standard

RADIOGRAM CABINETS

Many popular designs available including Swedish. First class finish. Send for catalogue.

ALL TYPES OF THREE SPEED RADIOGRAM UNITS.

H. B. RADIO PRODUCTS

5 Carrington Street,
Lewisham, SYDNEY.
Telephone: LM5580
Established 23 years.

WHAT IS THIS HIGH-G STORY?

Lately we have been hearing a good deal about a mysterious item called "High-G". All of a sudden it has become something that modern pick-ups should have, and we have even heard the term "High-G" records. Maybe it's time we had something to say about it.

MANY of us become somewhat sceptical about catchy titles as applied to modern developments, from motor oil to toothpaste. Some are important, some not. This high-G business isn't anything new, but it refers to an aspect of pick-up design which has now become, not merely desirable, but essential.

To explain the significance of the letter G would require a small physics lesson, but we can cut a few corners for the occasion and say that it represents a force equal to the pull of gravity. It is used as a unit of measurement to state the force operating on a body which changes its direction.

EXAMPLES OF G

The pilot of a fighter plane pulling out of a steep dive, finds he is pressing into his seat under a force of so many "G". If he pulls out too sharply, this force drains the blood from his head and he blacks out. His body has acquired an apparent extra weight.

A moving body coming to a halt must overcome a pressure which can be measured in G. The faster it moves, and the heavier it is, the more G are involved when it decides to stop. If it stops suddenly, G increases still further. If the pressure represented by the number of G is great enough, damage will be done. A car smashes itself into a wall, a railway train leaves the rails through taking a sharp turn too fast. G is, therefore, a very real thing.

STYLUS MOVEMENT

Now, when playing a record, the stylus tip of a pickup is forced by the groove shape to oscillate or vibrate. In doing this it moves first to one side, comes to a stop, moves to the other side, stops again, and repeats the process as long as the record plays. The force required to move the stylus is measured in our old friend G. If it should be ten times the pull of gravity, it would be 10G.

A little thought will show that a very light, freely suspended stylus will move much more easily than a heavy, stiffly damped one.

On a heavily recorded record, a stiff pick-up will tear through record grooves or even jump right out of them, grooves which the lighter job will track with ease. Why? The force applied to the stylus point is the same in each case, but the first pick-up is able to change its direction of movement much more easily than the second. It would take a much higher G to knock it out of a groove, and, therefore, it has been termed a high-G pick-up.

IMPLICATIONS

That's a rough and quick story of what G means. In practice, it's enough to get the idea that a high-G pickup is one the stylus of which will stay in firm contact with the sides of the record groove better than a low-G type.

The implication, of course, is that a satisfactory high-G pickup will keep to the record groove under all conditions met with in modern recording. It does this because its stylus point is able to accelerate at a very high rate, measured by recording engineers in centimetres per second. At extremely high frequencies it may be called upon to change its direction of movement almost instantaneously. If it fails to do so, the sharp brilliance of the sound will be lost and distortion will take place. Severe top cut filters would be needed to remove it, with fatal results to realism and no improvement in record wear.

Everything about modern records makes this job more difficult. In the old mechanical days, using 78 records with wide grooves, heavy sound boxes, and low amplitude recordings, things weren't so bad, and there were so many other difficulties that no one worried much about G.

ELECTRICAL RECORDS

Electrical recording made a big difference because it made heavier recording possible. The point had now to travel a longer distance in the same time. It also extended the upper frequency range, which meant that the point had to change its direction more often each second. The soft steel needles had a terrible time. No wonder someone referred to records of those days as a "song and an encore". The G's had gone up with a vengeance!

NEW STYLUS TIPS

With time, matters vastly improved, in spite of the remorseless advance of G. The practicable amplitude of groove swing was halted by the danger of cutting into adjacent grooves, but the climbing high-frequency response called for pickups whose stylii could move faster and faster. The capture of wider range produced grooves with sudden and sharp changes in direction as the recording stylus traced more and more complicated groove patterns on the wax. Pickups had to be made to handle still more G.

How was this done?

Firstly, the weight of moving parts had to be reduced to a minimum. Needles and needle chucks went by the board. The modern pickup rates the weight of moving parts in milligrams, not ounces.

Secondly, the damping of the moving part or armature was reduced so that the stylus tip could change its direction with the least possible restraint.

Thirdly, the steel tip gave way to a more durable material, such as sapphire or diamond, which could be accurately ground to shape. Great care was taken to control the record groove dimensions to ensure that the stylus tip rode at the correct depth in the groove, and that the surfaces of both were smooth and clean. Damping or compliance was adjusted to allow the point to move slightly in a vertical direction to compensate for pinch effect.

But let's skip the less obvious design points and continue the story. The microgroove record came along just as we felt we had the pickup problem licked. It scaled everything down by about two-thirds and made life much harder. Despite what had been done, many commercial pickups started jumping grooves again and tearing up

Wherever the Faithful Recording and Reproduction of Speech and Music is Required . . .

FERRY
DELUXE
RADIO-TAPE RECORDERS
(with built-in B/cast Radio Tuner)
and
TAPE RECORDERS
(without radio)

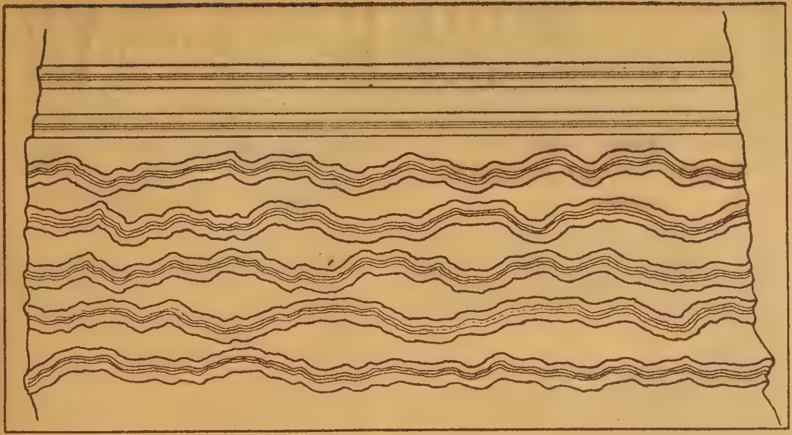
Manufactured and Guaranteed by—

FERRY SOUND INDUSTRIES

175 WOODLAND STREET,
BALGOWLAH, N.S.W. XJ1856

99 SPRINGBANK ROAD,
CLAPHAM, S.A. U2446

Victorian Agents:—
TOPLINE RECORDING SERVICE, 5 Buckley St., Noble Park, Vic. UM9402



This enlarged tracing of an MP record shows the wide spacing between grooves—approximately 50-50 ratio of groove to land, and the high lateral groove displacement under full modulation. The normal land width, .0034in, has been reduced to .0005in at top left. Only high-G pickups can successfully follow these grooves.

records. Old man G had multiplied himself a few times, and it almost needed hand-made pickups to keep ahead of him.

Microgroove development thought up some particularly nasty improvements from the pickup's point of view. Variable grooving is perhaps the nastiest. This is a process which runs the grooves closer together on soft passages than on loud ones. These obviously need more elbow room to accommodate their wider swing. Really quiet recording takes up very little more room than a plain groove, and can be spaced 300 per inch or better. Loud passages knock this back to possibly 150 grooves or less. The *coup de grace* comes with the high degree of pre-emphasis on the high frequencies which, of course, require the point to move so much faster per second. These have been boosted so that at 10,000 cycles per second they might be 12 db (about 4 times) more heavily etched than before.

MEASURING G

The point is made, I think, that modern records just must have high-G pickups to play them. Engineers do many fancy sums working out just what vinylite and sapphires can stand. One manufacturer says that, at 10,000 cycles, the stylus point pressure due to the acceleration demanded by a modern LP record could reach 2000G. That's a fantastic figure.

Just recently we have had a newcomer to the microgroove scene—a record called a Medium Play. It is a 33 rpm record intended for music too short for a full-sized LP but too long for a 45 or 78 disc without a turnover. Many popular overtures, for instance, and operatic selections would be ideal for MP records.

But being 10in types, and having plenty of recording area available, the manufacturers conceived the idea of widening the groove spacing to an average of about 150 per inch, and bumping up the recorded volume which this extra clearance between grooves made possible. In addition, they increased the high frequency pre-emphasis by several db. They really meant to have that record groove working all the time!

Now this process makes for quite a record. Extremely heavy recording is possible, so that loud passages can be made much louder than our standard LP without danger of overcutting. As the soft passages can be just as quiet as before, the contrast between soft and loud (dynamic range) has been considerably improved. The extra pre-emphasis allows extra top-cut in play-back and therefore reduced surface noise. The best of these records sound terrific—brilliant in the extreme and with enormous dynamic range.

IDEA NOT NEW

But what about our old friend G? He must just about have reached top limit? He has. There can be no half-measures with these records. Only really high-G or high compliance pickups will look at them. The rest will fold up at the first real fortissimo.

There are, of course, a number of pickups which have always been good enough to play records such as these. As previously pointed out the high-G idea isn't new in itself, and really good pick-ups have always been made with this feature as a requirement.

It is the mass-produced, commercial types, such as are used on record-changers, commercial radiograms and so on, which have had to undergo a face-lift. Many readers using special pick-ups will have selected them in the first instance because of their ability to track the severest microgrooves with ease. But we can foresee much consternation among owners of early radiograms the first time an MP goes on the turntable.

BETTER PICKUPS

In summary, therefore, it seems certain that in order to play the latest LP records, particularly the MP types, better pickups will be required than have been widely used to date, particularly in the cheaper types, both crystal and magnetic.

The major requirement is a pickup of a type currently being described as high-G which will stand up to the heavily recorded grooves and high frequency pre-emphasis

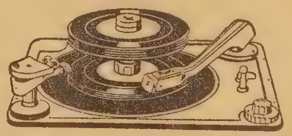
(Continued on Page 104)

Dual FAF

For all THREE speeds

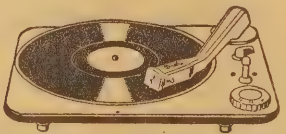
DUAL Recordchangers and players are the most advanced models available in Australia today. Masterpieces of engineering, their flawless reproduction ranges from 20 cps.—15,000 cps.

Recordchanger 1002F will change 10 MIXED 10in and 12in records and 10 7in records **with large centre-holes.** Changers and players may may also be used manually and 7in centre inserts are **supplied free** with each unit.



DUAL Changer Model 1002/F complete with NORMAL and LARGE CENTRESPINDLES.

PRICE (Sydney) **£35/12/6**



DUAL 3/Speed player chassis 275 complete with 3 position scratch filter, already mounted on springs.

PRICE (Sydney) **£19/10/6**

Available from better dealers everywhere.

DUAL Recordplayers and Changers are marketed and serviced by

FRED A. FALK & CO.
PTY. LTD.
28 King Street, Rockdale, N.S.W.
Telegrams: GRAMOFALK.
PHONE: LX 4783.
Agents in all States

You'll need a "PLATTERRACK"

SHORT-WAVE NOTES BY ART CUSHEN

Details on the short-wave service of the New Zealand Broadcasting Service, listened to by many short-wave listeners in Australia and the South Pacific, is our feature this month.

RADIO NEW ZEALAND is the short-wave station of the NZBS, and while it is received well at times in North America, and Japan, and in other parts of the world, it is intended to cover primarily listeners in Australia and the Pacific Islands. Radio New Zealand first commenced operations on September 27, 1948, after testing during 1947 and 1948. The program "Calling Australia and the Pacific Islands" was broadcast from 5 pm daily for two hours, but in response to popular demand, the program has since been increased to four hours. In addition, Radio New Zealand broadcasts one of the Home Service programs of the New Zealand Broadcasting Service from 3.45 am to 4.45 pm.

TRANSMITTERS

The two transmitters of Radio New Zealand are situated at Tatahi Bay transmitting station, the largest transmitting station of the NZBS and is some 20 miles north of the capital city, Wellington.

The building also houses three broadcast band transmitters, two of these being 60.000 watters. The transmitters were designed and constructed by Amalgamated Wireless (A'asia) Ltd, and are capable of operating with crystal control on any frequency from 6000Kcs to 2200Kc. The transmitters deliver a power of 7500 watts to the transmission line.

AERIALS

Radio New Zealand employs an Australian aerial, bearing 285 degrees east of north, while the Pacific Island aerials are directed 025 degrees east of north. The aerials are curtain fed three element folded dipole radiators, with a curtain of single-element. The aerials are mounted on guyed 70ft hardwood poles. Up to the present aerial switching has been by manual operation, with change over straps arranged on a wooden switching frame. Automatic switching, remotely controlled from inside the transmitter building, is in the process of being installed.

STUDIOS

The Studios of Radio New Zealand are in Wellington City, in a section of the building which houses the studios and control rooms of several of the broadcast band transmitters. Programs are fed to the transmitters at Tatahi Bay, over the distance of 20 miles, by landlines which are compensated to transmit speech and music with good quality. At Tatahi Bay facilities are provided for emergency operation if contact with the city studio is lost.

Radio New Zealand's present schedule which became effective on April 23 is:

To Australia — 4.00-6.45 am on ZL18 (9520), 7.00 am-2.45 pm on ZL19 (11830), 3.00 pm-close down on ZL18 (9520).

To Pacific Islands — 4.00-6.45 am on ZL2 (9540), 7.00 am-2.45 pm on ZL3 (11780), 3.00 pm-close down on ZL2 (9540).

Radio New Zealand's close down times are 8.45 pm week days, 9.20 pm Saturday, and 8.00 pm Sunday.

Highlight of Radio New Zealand's broadcasts includes the program of DX news "This Radio Age" on the first Tuesday of each month, at 7.20 pm conducted by Cleve Costello. Radio New Zealand broadcasts a news bulletin daily at 6.30 pm, while listeners' letters are answered on Friday at 7.15 pm.

Reports on the reception of Radio New Zealand are verified by an attractive card, depicting a map of the country and should be sent to New Zealand Broadcasting Service, Shortwave Division, PO Box 2396, Wellington.

FLASHES FROM EVERYWHERE

PORTUGAL.—Emisora Nacional, Lisbon, has been heard by Jim Paris, Prospect, SA, using 12180Kc in the transmission, 12.45-2.30 am. The station uses a chime as interval signal, and the transmission is beamed to Portuguese China. Radio Sweden reports the frequency is now 11964Kc and that the earlier 9.0-11.0 pm transmission is also carried on this new 25M frequency, which appears to be an experimental outlet, for in the past two weeks signals have been noted on 12180, 12140, 11964 and 11920Kc.

EGYPT.—Cairo Radio was heard last month in the 41M band, on 7060Kc for the evening transmission, to sign off at 5.0 pm. A new 25M band frequency, on 12020Kc which replaces the 11965Kc transmitter. The use of these two frequencies seems to be made in both the 2.0-5.0 pm, and the 3.0-7.20 am broadcasts.

JAPAN.—The first short-wave commercial station in Japan, is due to commence operation next month. The station, which will have two 5000W transmitters, has been assigned the calls and frequencies of JOZ (3925) and JOZ2 (6095). The station will be operated by the Nippon Kasai Press, Tokio.

NIGERIA.—Lagos, operating on 4800Kc has been heard in South Australia at 6.30 am irregularly for the last four months. Signals at Rex Gillett's location were only fair, and station fades out at 7.0 am. The complete schedule of Lagos is, 2.0-8.10 am, 5.30-6.0 pm 7.30-11.0 pm. On Sundays the schedule is 5.0-11.0 pm, and 2.15-8.10 am (Monday).

COSTA RICA.—TIFC "The Lighthouse of the Caribe", PO Box 2710, San Jose, broadcasts missionary programs, which are received at present at very good strength on 9645Kc. TIFC broadcasts in English 12.55-2.0 pm daily, and 1.0-2.0 pm (Monday). TIFC announces that due to electricity shortage, the transmissions are now 9.0 pm-4.0 am, 9.0 am-2.0 pm. The broadcasts of TIFC is usually spoilt between 1.15-1.45 pm, when the BBC transmitter, GVZ (9640) carries the Russian session, which is badly jammed.

HAVE YOU HEARD . . . Radio Brazzaville, now on 9620Kc from 9440Kc with English news 5.0, 6.50, 8.45 am — Radio Azores, moved from 11090Kc to 11925Kc 6.0-7.0 am — Voice of Evangilisation, Tangier, English Tuesday, Thursday, Saturday, 6.30-7.0 am on 7305Kc, 2500w, reports Radio Sweden. Pitcairn Island using 12100Kc for the 3.0-4.0 pm broadcast—Madrid using the new 9585Kc frequency with English to North America, 1.15-1.50 pm. TGNA, Guatemala City, on 9665Kc and 11850Kc with missionary broadcasts to 2.45 pm daily.

FROM THIS MONTH'S MAILBAG

BRITISH HONDURAS.—The British Honduras Broadcasting Service, at Belize, confirmed our 1952 winter report on 4900Kc with a new card showing a map of this Central American country. The station gives schedule as 4.0-5.0 am, and 10.0 am-1.0 pm, and transmissions are made on 3300, 4900 and 6100Kc. The 60M frequency is now thought to be 4950Kc according to World Radio Handbook, which lists the power as 5000W on this frequency. This station was heard with sign off at 2 pm during the 1952 winter dx season on 60M but the sign off at 1 pm now would just about make reception impossible at that hour, though Australian listeners should be able to hear the 5.0 am when conditions are favorable. BHBS made our 134th country verified, and our 1700th short-wave commercial broadcaster

CHINA.—Radio Peiping advises that the frequency of 9760Kc which we reported hearing in November, was used because a special program was being broadcast. It was the last of a series of recordings on the "germ warfare" subject.

TAIWAN.—The Broadcasting Corporation of China, Broadcasting House, Ren-ai Road, Section 3, Taipeh, confirmed reception by letter from H. P. Tseng, Acting General Manager. As readers are aware, for several months report to the Taiwan stations have never been properly verified, often only a program schedule being sent as an acknowledgement of a report submitted. Mr. Tseng promises verification by card to all future reporters to Taiwan. The Taiwan transmitter of "The Voice of Free China" broadcasts to South Pacific 8.30-11.0 pm daily on BED4 (11735), BED7 (7130). English is not now broadcast in this transmission, but is carried to Europe at 5.20 am on BED4 (11920) and to the United States, 2.5-2.20 pm and 3.35-3.50 pm on BED6 (11735) and BED3 (15235).

CEYLON.—The Commercial Service of Radio Ceylon, Box 574, Colombo, verified with the usual form letter, but is also enclosing a very colorful booklet on the Commercial Service which shows staff members, and studio activities. The Service employs a staff of 38 under the Director of Commercial Broadcasting, Mr. C. R. Dodd.

TAHITI ON THREE FREQUENCIES

Broadcast from Papeete, Tahiti, is now carried on three frequencies, the reception of one of these outlets we reported in recent issues.

MR. J. SHORTALL, of Auckland, has received information from the Chief of the Service of Posts and Telecommunications, Papeete, concerning the present activity of the station. Broadcasts are now given only in French and Tahitian, and three frequencies are used, but only two for each transmission. The schedule of Papeete is as follows:—2.0-3.0 pm on 6135, 7027Kc (Tahitian); 3.0-5.0 pm on 7025, 7125Kc (French), 8.0-8.15 am, 7025, 7125 (Tahitian), and 8.15-9.0 am, 7025, 7125Kc (French). It is assumed that one transmitter is beamed south-east to cover the Tuamotu, and the other north-east to cover the Marquesas.

The former Radio Tahiti broadcasts beamed to overseas listeners two years ago have been abandoned, and the above schedules is the only broadcast made from French Oceania, and the broadcasts are intended only for reception in that area.

Readers may remember that two years ago the broadcasts from Tahiti were also given in English, when news on the tourist attractions of the islands were given in detail, and some of the carnival proceedings broadcast.

Reception from the Papeete station in New Zealand is very patchy, for the past month the 7125Kc station has been the best signal but the use of Warsaw of 7110Kc makes reception now difficult. At present the 7025Kc station has shown much improved strength, and is best at 4 pm, when recorded, and live broadcasts of concerts have been featured. Power of the Tahiti transmitters is given as 1000 and 200W.

NOTES for next issue to 212 Earn St., Invercargill, New Zealand. All times are Eastern Australian Standard Time.

THE HAM BANDS WITH BILL MOORE

BEST DX CONTACTS STILL ON LOWER FREQUENCIES

The lower frequency bands at 3.5 and 7 mc/s have been providing the most interesting international contacts in the last year. The main problem is the high static level which makes operation difficult during the summer. It will be some years before the higher frequency bands will be at a peak for DX working.

THE second weekend in March of the CW section of the ARRL's W/VE DX contest provided even better propagation conditions on the 3.5 mc band than were experienced during the first weekend held in February. W signals during both evenings were at excellent strength.

It was reminiscent of prewar 14 mc activity when VK signals reaching the US were not very plentiful, and after a CQ, a number of W stations were always waiting to make contact after the completion of each QSO.

During the contest, a single CQ on 3.5 was sufficient to tally 20 W contacts from the east to the west coast. Many stations enjoyed the lack of QRN and the multitude of W signals audible.

A number of stations were heard making full use of the band, including VK2HC, VK2VN, VK7LZ, VK3FH, VK3AHH, VK2GW, VK2QL, VK2APL, VK2HZ.

Morrie, VK2VN, recorded 32 W contacts in the hour. Perhaps other stations exceeded this figure.

The most interesting effect was that the W's seemed to come in batches, 20 contacts or so, and then a break. There seemed to be no specific reason for the breaks, but it was perhaps due to QRM in the US.

In selecting a frequency for operation it was necessary to clear the other DX stations JA, KH6, KL7, &c., which were also audible in the US at the same time. Plenty of W stations were operating on these frequencies.

KL7FAI was running S8 at one stage, and KH6's were at excellent strength too, but the JA's with their low power were rather weak.

It is doubtful whether better DX conditions have ever been experienced in the evenings on the 3.5 mc band.

On the following evenings the band was again dead, but it is possibly too much to expect the W's to operate in the small hours, even to contact a few VK's.

Late in March, radio amateurs who were active during the North Coast floods, attended a special meeting held at Lismore to discuss various communication aspects of flood emergencies. The meeting comprised representatives of the PMG's Department, NSW Police Department, radio amateurs and other interested bodies.

They considered possible improvements to communication circuits in future emergencies.

The Postmaster-General, Mr. H. L. Anthony, in a Press release in late March, complimented radio amateurs for maintaining communications during the recent floods on the North Coast of NSW.

"The floods caused the loss of many valuable lives and the destruction of property worth millions of pounds," Mr. Anthony said. "The disaster, however, could have been worse had it not been for the prompt and unselfish work of radio amateurs during a vital period.

"Normal communication facilities were impossible, and centres such as Lismore and Murwillumbah were completely isolated."

Mr. Anthony said operators of amateur stations upheld the best traditions of Australian radio "Hams" in assisting the community in disaster such as flood and bushfire.

Mr. Anthony's statement was appreciated by the many amateurs on the North Coast of NSW that were active in the emergency.

RSGB NETWORK

The RSGB's new radio amateur emergency network is receiving acclaim from both amateurs and the public. Recent decisions in Great Britain on civil defence should also supply impetus to the organisation.

Main activity is still centred on the enrolling of members and the appointment of emergency communication officers for the various areas, also on the design and building of suitable emergency portable equipment.

In some areas, simulated emergency tests have been conducted and, on one occasion, stations stood by when a blizzard over a 16-mile radius isolated a number of villages.

The RSGB has produced a special RAEN lapel badge and also issue certificates to all net members.

HAM HEADLINES

It was found that, despite the fact that radio amateurs did not receive much acclaim in the daily Press for their work in the North Coast floods, they can still make the headlines.

Unfortunately it was poor publicity, and in bold type was headed, "Amateur Radio Broadcast Peril," and the article occupied a full column in the paper. The text centred about the fact that if amateur transmissions were outside the bands, interference could be caused to aircraft services.

It was really the story of how PMG wireless inspectors had found a "pirate" operating in Blacktown (NSW). Through a hole in a wall they observed the defendant operating a transmitter and talking to a ZL. His downfall, BCI; his fine, £8.

* * *

In the November, 1953, issue, a new proposed method of reporting telephony was described—the RSM code. It was inaugurated at the Lausanne IARU conference, the M portion, numbered 1 to 5, covering modulation.

The Region 1 IARU committee decided a technical article be prepared to explain the code. R. H. Hammans, G21G, interpreted the M section in the RSGB Bulletin.

He points out the M section of the code is a departure from the normal numerical scale for reporting, usually, as the number increases the strength or readability improves. In this case, however, although M1 and M5 represent the worst and best condition respectively, M 2, 3 and 4 cover specific faults in the transmission.

He analyses the various faults observed and under which M number they should be listed.

USE OF BFO

The most important feature is the use of the BFO when reporting upon telephony signals. Some of the M section of reports, if adopted, will be arbitrary, due mainly to the station receiving equipment in use, but when using the system, amateurs will be forced to closely examine incoming signals. This last feature will be a good move, as we often fail to do it now.

Regulations for amateur stations in the US, which have been in a state of flux for some time now, apparently have finally been resolved.

The ARRL is now only offering comment on three minor proposed changes. In the first case it supports the use of MM operation on all amateur bands, as opposed to the FCC proposal that worldwide privileges be introduced for mobile maritime operation on 21 Mc/s.

They support, however, the FCC's suggestion that novice and technical licensees be examined by mail only. In the first

WHAT QSL CARDS SHOULD TELL

If you are a newcomer to the hobby, or will shortly be getting QSL cards printed, it would possibly be well to consider necessary details that should be incorporated on such cards.

The data is important if stations are to use your cards for a claim for any of the many DX certificates available these days. To qualify for these awards it is usual to forward cards as verifications of contacts made.

The societies granting DX awards require certain information to be clearly shown on cards, and the layout should be arranged to show full details. Signal reports are required, as a minimum of R3 and S3 is set by the RSGB, for instance.

In prewar years it was fashionable to cram as much information as possible on cards, from the weather to the height of the antenna.

Generally, these days, details supplied are cut to a minimum and often are insufficient to cover necessary information for DX awards.

Make certain that QSL cards confirm the QSO—not just your signals HR RST5GG.

Committees examining the later information cannot say whether the cards cover a contact or not. Cards laid out as above are invariably rejected.

The correct procedure would be to commence: "To radio FB8ZZ in confirmation of our contact."

Be sure to mention the band on which the contact is made, as this is very necessary if the card is to be used for an Empire DX certificate, as multiband operation is an essential feature of this award. This can also apply to a WAC for 3.5 mc, for instance.

Clearly show whether the card confirms a CW or Telephony contact, as so many societies issue certificates for both types of emission.

The date of contact is also important, as a number of awards have been granted from a specific date.

An arrangement that should comply with all requirements and keeps writing to a minimum is as follows:—

To Radio ... confirming our CW/Fone
...... MC/S contact on ...... 19, at
......E.A.S.T. Your signals RST .....

The information shown and not applicable can be struck out.

NEW LOW PRICE & IMMEDIATE DELIVERY

PLESSEY 3-SPEED INTERMIX RECORD CHANGER

An unprecedented demand for Plessey Changers (popularity on the Continent and easing of Australian import restrictions) has enabled increased production with consequent lowering of price and improvement in availability.

Retail Price £17/12/6 each

Retailers! Contact us for your price and supplies.

- Fully automatic at 3 speeds—78-45-33 1/3 r.p.m.
- Wide response microcell crystal pick-up.
- Mixes 10in and 12in records at 33 1/3 and 78 r.p.m.
- Plays and changes 7in records at 45 r.p.m.
- Easily replaceable duo-point sapphire stylus
- Plays up to 10 records at a single recital.
- Immediate delivery ex Sydney stocks.
- Exceptional value at £17/12/6 each retail.

UNITED RADIO DISTRIBUTORS PTY. LTD.

Radio-Electrical Wholesalers

Showroom: 175 PHILLIP ST., SYDNEY.
Phone: BL3954

SOLE AUSTRALIAN AGENTS: BRITISH MERCHANDISING PTY. LTD.

Free Specification Sheets Now Available! . . . Complete electrical specifications and physical dimensions, etc., of the A & R Standard Range can be had on application!

A & R

A & R Mailing List Members Please Note! . . . . Those persons who are already on our Mailing List need not apply for a copy of the New Specifications. This will be posted in due course.

A & R's Mail Order Service gives prompt attention to country and interstate orders. Melbourne clients can buy direct from our showroom! The transformers listed below are available for immediate delivery.

POWER AND FILAMENT TRANSFORMERS

TYPE No.	PRIMARY VOLS.	H.T.V. ASIDE	H.T. mA	FILAMENTS	PRICE
1636-3H	200-220-230-240	300	80	2 x 6.3v-2A; 5v-2A	42/9
1332-3H	200-220-230-240	300	120	2 x 6.3v-2A; 5v-3A	53/3
1356-3H	200-220-230-240	400	150	5v-3A; 2.5v-5A; 6.3v-4A	70/-
1371-8	200-220-230-240	500-600-750 850-1000	300		150/-
1400-19	200-220-230-240	565-500-425	250	2 x 6.3v-3A; 2x 2.5v-3A; 5b-3A	110/-
1643-23	230	—	—	6.3v TAP 5v-2A (500v insul)	17/6
1516-23	200-230-240	—	—	5v-3A (1000v insul)	30/-
1525-24	220-230-240	—	—	2.5-10A (1000v insul)	47/6
1305-22	200-220-230-240	—	—	2.5v-10A (3000v insul)	75/-

FILTER CHOKES—Swinging Chokes Marked *

TYPE No.	INDUCTANCE - HYS		CURRENT mA	APPROX. D.C. RES.	MAX D.C. Working Vol.	PRICE
	MAX	FULLRATE DC				
975-23	20	15	60	320	500	16/6
973-9	30	20	80	370	500	25/9
973-21	30	20	80	370	500	25/9
1012-1A	35	20	120	430	1000	35/3
967-1A	35	20	150	200	1000	46/-
956-1A	30	20	200	160	1000	57/9
1011-1A	30	15	250	160	1000	59/6
*983-1A	25	20/5	30/300	90	1000	65/6
986-1A	15	10	300	60	1000	62/6

★ **NOTE: 16-2/3rd per cent SALES TAX TO BE ADDED TO ABOVE PRICES**

FOR THE TRANSFORMERS YOU NEED, CALL, WRITE OR TELEPHONE TO:—

A & R ELECTRONIC EQUIPMENT COMPANY PTY. LTD.

HEAD OFFICE, FACTORY AND SALES
TELEGRAMS: "ARLEC", MELBOURNE

378 ST. KILDA ROAD, MELBOURNE, VIC.
(OPPOSITE THE SHRINE). TELEPHONE MX1150

lass, operation is limited to one year nly, and in the second case, operating rivileges are very limited. It is anticiated that these classes of licences will omprise nearly half of the applicants xamined during the coming year.

The league is not in favor of the FCC's deas on mileage limits for mail xaminations.

It is proposed that the present 125-mile imit be reduced to 50 miles for condiional class licences.

As this class of licence allows pracically unlimited operation facilities, they eel that the maximum number of aplicants should be examined personally. The mileage reduction would allow many icences to be granted by mail in the nore thickly populated parts on the east coast.

The limit is based from the quarterly examination points scattered throughout the US.

The main reason behind the introduction of mail facilities is to restrict the cost of these quarterly examinations.

WIA HANDBOOK

The 1954 edition of the Australian Radio Amateur Callbook, just published for the Wireless Institute of Australia by the Victorian division, fills a current need in every shack. Well produced, it will prove invaluable and would make an excellent present for your overseas amateur friend. Postage within the British Empire costs 5d, foreign rate 7d.

Bill Gronow, VK3WG, Federal president of the WIA, in the foreward, praises the work of volunteers in producing the callbook, and due credit must be given to the committee responsible.

The callbook is available from all divisions of the WIA and from leading booksellers. The cost, 4/6.

The annual election of officers of the Hunter branch of the WIA was held during March. Life member Lionel Swain, VK2CS, was elected president; George Lee, VK2AGD, vice-president; Chas Archbold, VK2ARV, secretary; and Bill Hall, VK2XT, treasurer.

The retiring president, Johnny Clarke, VK2DZ, and secretary, VK2SF, did not stand for re-election, due to pressure of business.

Hunter branch social events are renowned, and to ensure their future success, the following social committee will operate for 1954-55: Jim Cowan, VK2ZC; Harold Whyte, VK2AHA; Les Sparkes, VK2AOR; associate Frank Stubbs and the branch president.

Branch meetings are held on the second Friday of each month at the normal venue, the Technical College, Tighes Hill, Newcastle. An occasional meeting is scheduled for Maitland to cover the coalfield members.

Intending amateurs and radio enthusiasts are cordially invited to attend. The secretary's address is Lot 174, Alexander St., Wallsend, Newcastle.

Lecturer at the March meeting of the NSW division of the WIA was Mr. Don Lindsay, an engineer of AWA. He discussed DME — Distance Measuring Equipment—used extensively by aircraft in Australia. Mainly an Australian development, an interesting insight was given into the history and details of the equipment.

Don was well-known in the 20's and early 30's as VK2DY, was a WIA councillor, and was active on the UHF's in the original work on these frequencies.

In NSW the WIA's disposal equipment committee is again functioning, and various gear should shortly become available to members. The committee now operates under the chairmanship of Dr. Alex Dan, VK2ABU, other members being Bert Hay, VK2AGW, and Harry Solomons, VK2AJZ.

The annual meeting of the UHF section of the NSW division will be held at Science House, Sydney, on May 7.

Officers for 1954-55 will be elected. The lecturer for the meeting will be John Miller, VK2ANF, his subject being Noise Generators And Their Uses In Adjusting UHF Receivers. May 16 has been set aside for a field event, and actual details will be given over official station VK2WI.

The May meeting of the Hunter branch will be held at the Technical College, Tighes Hill, on Friday the 14th.

The NSW division completed their latest AOCP class on April 7, and students sat for their AOCP during the following week.

Lecturer for this class was Arthur Simmonds, VK2APJ, who will not be able to act in future, due to a change of vocation.

The new class lecturer is Leon Parr-Smith, VK2AOJ, and the class commences on April 21.

The voluntary work of many amateurs on Morse instruction and administration, including VK2FA, 2ASW, 2EL and 2AAW, make these classes possible, and so assist to introduce new amateurs to the hobby.

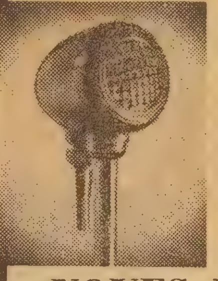
Visitor to Sydney on his honeymoon was Tom Hogan, VK3TX, editor of Amateur Radio for many years. All amateurs in NSW wish him the best in his venture. Jim Corbin, VK2YC, Dr. Leo M. Mahon, VK2AC, and Bill Lewis, VK2YB, met him during the trip.

A.O.C.P. CLASS

The Victorian Division A.O.C.P. Class commences on Thursday, 29th April, 1954.

WE STILL HAVE A FEW VACANCIES

Morse and Regulations are held on Monday and Theory on Thursday evenings from 8 to 10 pm. Persons desirous of being enrolled should communicate with the Secretary W.I.A., Victorian Division, 191 Queen St., Melbourne. *(Phone FJ6997 from 10 am to 4 pm), or the Class Manager on either of the above evenings.*



AWA RONETTE
MICROPHONES & ACCESSORIES
TYPE B110
£3-19-7
Technical pamphlets will be mailed on request.
Other types also available from
NOYES BROS.
59 George St., LAUNCESTON
and leading wholesalers.

Pocket Book
STORYTELLER WEEKLY HAS THE PICK OF THE WORLD'S BEST STORIES

RADIO Amateurs! *NOW AVAILABLE—*

THE LATEST
EDDYSTONE
COMMUNICATION RECEIVERS

ARRIVING SHORTLY!
"GELOSO" Transmitter V.F.O. Unit
TYPE M 4/101: A very stable five-band three valve V.F.O. unit fully wired and tested.
BANDS: 3.5—4, 7—7.45, 14—14.4, 21—21.6, 28—29.8 Mc/s.
DIAL: Fully calibrated and band spread over 180 degrees.
VALVES: (not supplied) 6J5 Oscillator, 6AUG isolator, 6V6 output.
OUTPUT: Tuned in each band giving at least 3.5 mA grid current to a single 807 on all bands.
POWER SUPPLIES: (not supplied) 400 volt at 32—54 mA.
PRICE £10-4-9
Amateur Net inc. S. Tax.
ORDER NOW — AVAILABLE SOON!

MODEL "740" (as illustrated) fulfils the demand for a sensitive receiver having wide coverage and available at a moderate price. Employs eight B8A valves in a straightforward superhet circuit of sound design.

FREQUENCY RANGE
Band 1. 30.6 Mc/s to 10.5 Mc/s.
Band 2. 10.6 Mc/s to 3.7 Mc/s.
Band 3. 3.8 Mc/s to 1.4 Mc/s.
Band 4. 205 metres to 620 metres.

MODEL "840". This model is similar in specification and performance to the "740" but incorporates a built-in speaker and operates from both AC. and DC. supplies—110/240 volt.

MODEL "750". Of double superhet type, this possesses very high selectivity with practically complete freedom from image interference. H.T. supply to the oscillators is stabilised.

FREQUENCY RANGE
Band 1. 32 Mc/s to 12 Mc/s.
Band 2. 12 Mc/s to 4.5 Mc/s.
Band 3. 4.5 Mc/s to 1.7 Mc/s.
Band 4. 1465 Kc/s to 480 Kc/s.

CHANDLERS PTY. LTD.
Head Office & Wholesale Dept., Cnr. ALBERT & CHARLOTTE STREETS, BRISBANE. FA0341
BRANCHES AT CAIRNS, TOWNSVILLE, MACKAY, ROCKHAMPHTON, BUNDABERG, MARYBOROUGH, TOOWOOMBA, WARWICK.

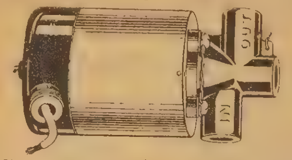
SURPLUS

512 Elizabeth St., Melbourne, C.1
'Phone: FJ5904. Just 4 doors

Mail Orders Carefully Packed
Please Add Freight or Postage

LIQUID SHUT OFF VALVES

Will work off 12 or 24 Volt, ideal for Water or Alcohol Injectors.

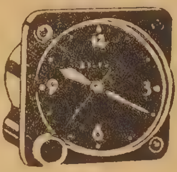


50/-

Can be used for Petrol shut off for car protection.

AMERICAN ELGIN 8-DAY AIRCRAFT CLOCKS.

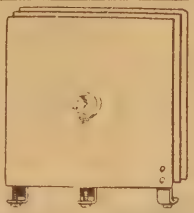
FIT
TO YOUR
CAR OR
TRUCK.



£5/5/-

The name of Elgin is world renowned and made by the best manufacturer in America.

BRAND NEW ENGLISH RECTIFIERS

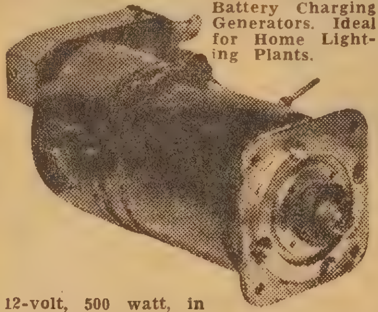


Make yourself a Battery Charger.

12v.	2 amp.	32/6
6v.	5 amp,	50/-
12v.	5 amp,	79/6
12v.	3 amp,	45/-
6v.	2 amp,	24/6
6v.	4 amp,	45/-

Transformers to suit above Rectifiers, 2 amp, 37/6; 6 volt. 5 amp, 45/-; 12 volt. 5 amp, 55/-.

Battery Charging Generators. Ideal for Home Lighting Plants.



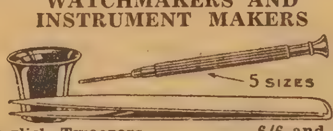
12-volt, 500 watt, in good working order	£5
12-volt, 500-watt, new	£7/10/-
24-volt, 1000-watt. Brand new,	£12/10/-
200 amp welding Generator, Made in America. Brand new	£50
Tested and in perfect order	£35

Be early these won't last long.

AMERICAN VACUUM or AIR PUMP

Builds up air pressure to 20lb at 1000 R.P.M. develops up to 120lb of hydraulic pressure; will pump 7½ gallons S.A.E. oil or other liquids per minute. Useful for spraying, milking, presses, oil burners, hydraulic systems .. £3/10/-

WATCHMAKERS AND INSTRUMENT MAKERS

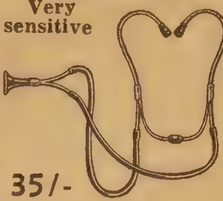


English Tweezers	6/6 and 5/6
Eyeglasses	6/6 and 8/6
Extra strong double lens Eyeglasses,	15/-
SCREWDRIVERS, set of 5	13/9

MECHANICS' STETHOSCOPES,

Ideal for Testing Engines, etc.

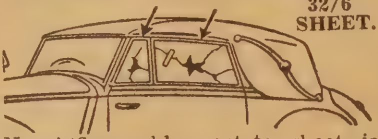
Very sensitive



35/-

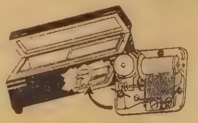
Replace those broken side curtains with cellulose acetate which takes the place of celluloid and lasts four times longer. Will not discolor.

32/6 SHEET.



Non-inflammable acetate sheet is recommended for all types of side curtain. Sheets are 20 thousandths of 1 inch thick. Size of sheet, 24in x 52in. Can be sewn or cemented into frames.

Now you can make your own music box with these Swiss music units. They can be fitted to any type of box, doll, jug, teddy bears, etc. Hours of enjoyment for all the family.



30/- EACH

Tunes available, Lili Marlene, The Teddy Bears Picnic, Jingle Bells and Blue Danube, Harry Lime Theme, Wedding March, The Merry Widow, Parade of the Wooden Soldiers, John Peel, etc.

ARMY FLUTES

39/6

Ideal for School Bands.
Never before at this amazing price.

BRAND NEW LEVER TYPE GREASE GUNS WORTH £4/19/6.

59/6

Ideal for all types of Trucks, Tractors or Cars. 7500 lbs pressure.

45/- COMPLETE

Professional Magnifier with Stand and Extension Arm. Useful Doctors, Painters, Mechanics, Engineers, Photographers.

ENGLISH ARMY SPOTLIGHTS

IDEAL
FOR
SHOOTING.
FIT ONE
TO YOUR
CAR.

6-volt 37/6 — 12-volt 25/-
Fitted with Mirror Reflector.

Aircraft 24 volt Motor complete with 400 gal. per hour Pump. Made In America.

Ideal for pumping any liquid. Many uses on any farm, £14/14/-

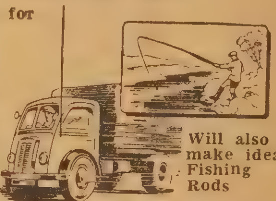
Will work off any 32-volt lighting plant.

Pump only, 55/-.

STEEL ARMY TANK AERIAL RODS. WILL MAKE IDEAL RADIO AERIALS FOR CAR OR TRUCKS

Too long for postage. Advise nearest railway station.

Base to suit Aerial, 9/6 each.



Will also make ideal Fishing Rods

12ft long, 3 sections. Each section 4ft, 22/6. 8ft long, 2 sections, 15/-.

SPECIAL DISPOSALS METER OFFER.

MILLIAMPERES

0-10 amp meters, AC-DC, 2¼in dial,	15/-
0-1 milliamp, 2½in dial	37/6
Weston 0-50 volt 0-100 amps combined M/coil,	£3/10/-
English 50-0-50 Ammeters, M/Coil	37/6
Eng. 0-50 Ammeters AC-DC	42/-
English 0-20 Voltmeters, M/Coil	25/-
English 0-40 Voltmeter, M/Coil	25/-
English 0-300 AC-DC Voltmeters	55/-
English 0-5 Milliammeters, 2¼in	27/6
English 0-150 Milliammeters, 2¼in	30/-
English 0-25 Ammeters, 2½in M/c	30/-
English 0-10 Ammeters, 2¼in dial, Moving Coil	45/-
English 0-30 Voltmeters, 2½in dial AC-DC	42/-
Eng. 0-40 Ammeters. 2¼in dial AC-DC	42/-
Eng. 0-50 Ammeters, AC-DC	42/-
Eng. 0-3 Ammeters 2¼ dial, AC-DC	45/-
Eng. 0-150 Voltmeter, 3in Dial, Moving Coil	39/6
Eng. 0-500 Micro Ammeter M/coil	37/6
Eng. 0-150 Ammeter, 3½ Dial, AC-DC	75/-
Eng. 0-20 amps, 2in Dial, M/c	25/-
Eng. 0-1½ Milliamps, 2in Dial, M/c	19/6
Eng. 0-20 Milliamps, 2¾ Dial, AC-DC	17/6
Eng. Multimeter, reads ohms and volts	35/-

ELECTRIC ENGRAVER

What everybody has been waiting for. An Electric Engraver that works off your car battery.

Engraves anything in metal.

Ideal for name tags, dog collars, plant labels, etc.

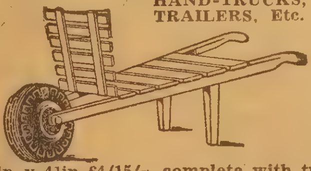
29/6

Engrave your name on all your tools. Marked tools are never stolen. No Garage should be without one.

STORES

512 Elizabeth St., Melbourne, C.1.
from Victoria Street. 'Phone FJ5904
and Efficiently Despatched
Include State in Address

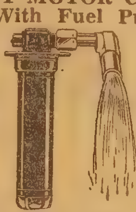
Brand new AEROPLANE WHEELS
IDEAL FOR WHEELBARROWS, HAND-TRUCKS, TRAILERS, Etc.



10½in x 4½in £4/15/-, complete with tube.

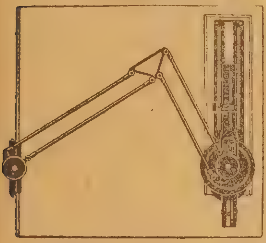
24-VOLT MOTOR COMPLETE
With Fuel Pump

Ideal for Caravans. Takes the place of Hand Pumps. £5 each.



Many uses on the Farm. Will transfer Petrol or any Liquid from Drums, etc. Will work from 24 or 32 volts. AC or DC.

R.A.F. PLOTTING BOARD WITH ARM



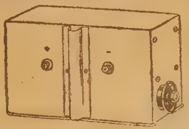
Bakelite Base. Draws Angles Parallel or Vertical

70/-

IDEAL FOR ENGINEERS, STUDENTS, ETC.

COMPLETE BATTERY CHARGER

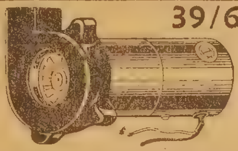
Fitted with Brand New English Selenium Rectifier.



Works off 230v. Household supply.

Charges any battery, 6 volts at 4 amps. £6/15/- complete. Also available, 6 or 12 volt Chargers combined. Charge 2 amps, £7/15/-. Brand new 6 volt, 2 amp Chargers, complete, £5/2/6.

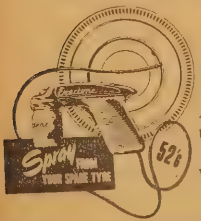
English Motor and Blower, 24 volts.
Will work off any 32v Lighting Plant.



39/6

Larger size also available that will work off 12 or 24 volts £3/15/-.

SPRAY YOUR CAR, TOYS, HOBBIES, FURNITURE


Spray from your spare tyre
52/6

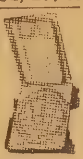
52/6

Spray from your Spare Tyre

An Ideal Tool for touching up damaged paintwork. Will spray Lacquer, Paint, Enamel.

Stock and Die sets, ½in., ¾in. and 1in. water pipe. £4/19/6.

IN FIRST CLASS ORDER DALTON COMPUTERS IDEAL FOR AERO CLUB. 45/-

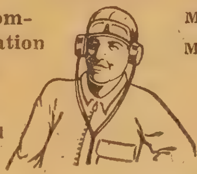


Aircraft Bomb Hoists ideal for garage work. £6/15/-

R.A.F. LEATHER FLYING HELMETS 35/-.

Intercommunication Tubes 50/- set.

Polaroid Goggles 48/6



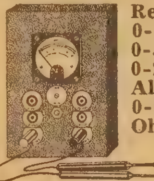
MK8 Goggles 48/6 PR.
MK7 Goggles 37/6.

WOOL LINED FLYING BOOTS £5/15/- pr.

AIR MIN. MULTI TESTER TESTS OHMS and VOLTS

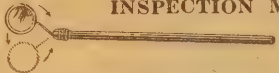
COMPLETE WITH TEST PRODS

£5/17/6



Reads 0-10 Volts, 0-50 Volts, 0-250 Volts
Also 0-10,000 Ohms.

BALL AND SOCKET INSPECTION MIRRORS

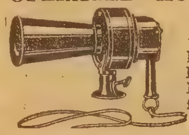


8/9 each

Ideal for mechanics, radio repairs,

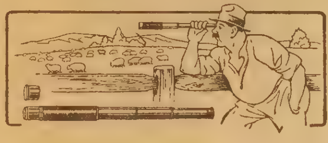
GENUINE AMERICAN KLAXON HAND OPERATED HORNS

Very Loud. Ideal for Factories, Trucks, Boats, etc.



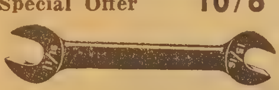
Useful for Time keepers. Brand New. £4/4/-.

ARMY SPOTTING TELESCOPES
Many uses on the farm. Ideal for Sheep Spotting.



Useful on the rifle range. 3 draw 17in. long 6½in closed 1in object lens 18 magnification, made in England. £7/19/6

FOR MOTORIST
Special Offer 10/6 Pair



2 genuine American Herbrand spanners, ¾ x 7-8, 1 1-16 x 15-16.

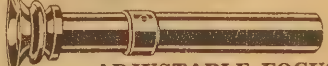
SPECIAL OFFERS

American Schrader tyre pumps, work from your spark plugs, **39/6.** Fish pond aerators, work from 230 volts, **57/6.** Commando Telescopes, ground lens, **45/-.** Sampson low pressure Spray Guns, **£6/17/6.** Micro amp meters, suitable for making photographic light meters, **17/6.** Aircraft Pressure Gauges, 0 to 20lb pressure, **22/6**; 0-200lb, **25/-.** Pressure type Oil Cans. **15/6.** Aircraft Rev Counters, extra long lead, ideal for boats or cars, **75/-.** All Steel Mechanics' Tool Boxes, lift out tray, **32/6.** German Marc Hing Compass; takes place of Prismatic, **29/6.** Pocket Magnifying Glasses, 8 mags, **8/6**; 10 magnifications, **12/6.** Metal Drill Sets, 1-16 to 3-16, 9 Drills for **3/6.** 24 volt motor and hydraulic pump, capacity 3½ gals. per minute, **£3/15/-.** Automatic actuators with 24-volt motor geared with telescopic shaft 400 r.p.m., can be used as fence post borer, etc. **55/-.** Hydraulic pumps, 1200 p.s.i., 8 1-3 gal. per min.; **£18/18/-.** 5 gal. per min., **£7/10/-.** Generator Test Meters, 35-0-35 amp meters, 4¼in dial, **45/-**; 0-10 volt meters, 4¼in dial **45/-.** Loading Resistors can be supplied to make meter read 10.20 at **12/6.** Medical Scalpels, many uses, photographers, etc., **6/6.** Shaded Pole Induction Motors made in England, 230 volts, AC. Ideal for Projectors, Tape Recorders, Fans, etc., **45/-.** 1/30 H.P. SAE open end Spanners, 6 to set, **24/6.** Whitworth, 4 to set, **18/6.** 2½in Paint Brushes, set in rubber, special price, **10/6.** Brand new 7-8in Spark Plugs, suit most old type cars, **2/6 ea.** Tapped Transformers, 6, 12, 18 and 24 volts, 3 amps, **39/6,** 230 volts input. Low pressure Spray Guns, **39/6.** Army Steel Tow Ropes with looped ends, **17/6.** Army Tripod for photographic work, levels, etc., 41in long, **22/6** Whitworth Spanner Sets, open one end, ring the other, **25/-.** 6 spanners to set. 230 volt AC Neon Testers **4/6.** New headphones suitable for crystal sets, **17/6** pair. Genuine Lucas 12 volt Horns worth £3/15/-. Our price **39/6** new. Genuine Stanley Lino Cutting or Hobby Knife with 5 blades **9/9** complete. American Mae West Life Jackets, brand new, **25/-.**

ARMY FOCUSING TELESCOPE

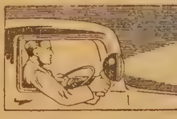
Easily converted for use on dumpy levels.

Can be used as a rifle sight.
Excellent magnification .. £4/19/6
Fitted with cross hair.



ADJUSTABLE FOCUS

At Last! The spotlight you have been waiting for.



Complete with flex and switch.

63/6

Fitted with genuine American sealed beam 6-volt globes. No motorist or boat owner should be without one.

Ideal for Fox or Rabbit Shooting

OFF THE RECORD—MONTHLY REVIEW

(Continued from Page 93)

OFFENBACH: Gaite Parisienne Ballet (orchestrated by Manuel Rosenthal), played by the Boston Promenade Orchestra, conducted by Arthur Fiedler. HMV. CLP 1004.

A bright, breezy record that all will appreciate of music arranged from various Offenbach scores. It was used by the Monte Carlo Russian Ballet, and is often heard in part. The tempo is brisk and the music always tuneful with unmistakable atmosphere of the dance as distinctive as that of Johann Strauss himself.

The conductor and orchestra achieve and keep this air of excitement and color without a break, and if the recording isn't always first class it isn't at all bad for all that. Much more important is the essential gusto which goes with the music. There just isn't a dull moment.

You get a
20 INCH TAPE BONUS
when you buy ½"
LUNCH WRAPS
FIX SHELF PAPER
KEEP BOOKS CLEAN
HOLD BINDINGS IN PLACE
SAVE CRACKED EGGS!
BEAR TAPE
BRAND
THERE'S A FULL 200" x ½" TAPE IN THIS BEAR BRAND PLASTIC DISPENSER
BEAR BRAND CELLULOSE TAPE

Your storekeeper uses this width . . . so follow the lead of men and women who use tape most. And, in addition, "BEAR TAPE" seals tighter, mends better, and holds faster, because it's made here for Australian conditions.

"BEAR" ½" x 200" rolls, in gaily coloured plastic dispensers, cost only 1/9 each everywhere.

BEHR-MANNING, makers of the famous "BEAR TAPE," are also the largest manufacturers in the Southern Hemisphere of high-quality Sandpapers, Pressure-sensitive Tapes, Adhesives and Coatings, as well as being makers of "PROOFKOTE."

Y77C

RAMEAU: Suite in E Minc Suite in A Minor. Played by Fe nando Valenti, Harpsichord. Wes minster WL 5128.

This record is a particularly go example of harpsichord playing ar harpsichord tone. Not everyo will appreciate it musically, for the is a certain sense of monotony our ears which probably was n so noticeable to listeners before t more flexible piano came into vogu Leaving that possibility aside, the records demonstrate very clearly i deed the tonal range of the harp sichord, which isn't aas simple an i strument as might be imagined.

Valenti, although a young ma is already a famous exponent. H is, in fact, an extremely brillia technician, and if we are rathe overburdened with this impressio we must remember that the per former hasn't the same control ove his "touch" as has the pianist.

Musically these suites are prob ably as representative of harpsi chord music as we are likely t hear, and as such I can recommen them.

THE HIGH-G STORY

(Continued from Page 97)

without jumping grooves, damaging records, and producing distortion.

Fortunately record and pick-up manufacturers have been working together on this problem, and it should be possible for almost everyone to obtain suitable pick-ups and pick-up heads to modify their equipment, whether home-made, custom-built or commercial.

Incidentally, these remarks have by no means disposed of the MP records as such. They have other interesting characteristics not directly connected with this story. One might be mentioned which is that because of the deeper-cut grooves, surface scratches aren't so likely to show up in playing. As these records no doubt will find their way to 3-speed record changers, the ability of the surface to take a beating is quite valuable. Nor need the stylus be ground to such fine tolerances with the deeper groove. An oversize tip isn't so likely to jump off the rails under extreme pressure.

BETTER STYLE

There is one matter which we are continually stressing, because of its extreme importance, and that is that the useful life of a stylus point is being drastically reduced as the demands upon it grow increasingly greater. Early experience with MP records were most disappointing until they were played with a stylus known to be in perfect order. The idea that a sapphire is a permanent point is quite wrong. It will need replacement at regular intervals if you want good results.

In fact it is becoming more and more obvious that something better than sapphire is rapidly becoming a necessity if frequent replacement is a nuisance. At the moment the diamond point looks to be the next step, and represents a big improvement. It shouldn't be so costly as against an equivalent number of sapphires, and more common use would reasonably be expected to reduce price and increase availability.

MAKING A BRICK INCINERATOR

A small brick incinerator will solve the problem of disposing of household and garden rubbish. What is equally important, the ashes from it will be valuable as a fertiliser for future crops.

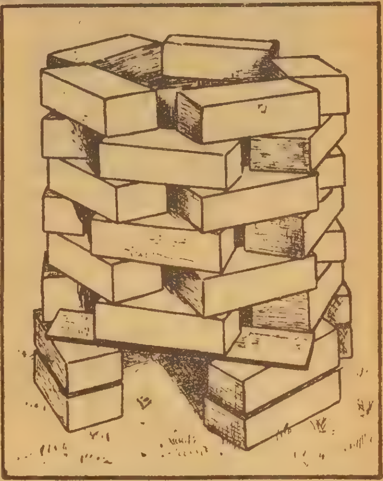


Fig. 1. — A small incinerator built with old bricks costing five shillings.

THE small incinerator shown in Fig. 1 can be built up with 40 second-hand bricks which will cost only a few shillings at a local builder's yard. In this incinerator all kinds of garden rubbish are burnt just as efficiently as in an iron appliance costing many times the price.

Having obtained the necessary bricks, select a suitable flat piece of ground at the end of the garden farthest from the house, and arrange five of the bricks, as shown in Fig. 2.

If you happen to have a piece of old sheet metal of suitable size you can lay the bricks on this; if not, it can be dispensed with.

Allow a space of roughly 1in between the inner corners of the bricks, except at the opening at the front, and here a space of 6in wide should be left, as indicated in the illustration.

STEEL SUPPORT

On top of each of these bricks another one is laid, and then across this second layer of bricks, over the opening, a piece of iron plate is placed. In the writer's case this consisted of a piece of stout sheet metal, 17in by 8in, folded on the centre line and hammered flat, making a plate 4in wide. This plate supports the bricks above.

The remaining bricks are carefully arranged, as shown in Fig. 1, starting with the one over the opening, and allowing five .bricks for each layer.

One advantage of this type of incinerator, with regular air openings, is that it burns equally well no matter in what direction the wind is blowing.

If an incinerator of much larger capacity is required, the type illustrated in Fig. 3 can be built. Old bricks can be used, as before, and for this incinerator, which has capacity of approximately 5 cubic feet, 98 bricks will be required.

Fig. 4 shows how the first two layers (each of 9 bricks) are arranged in the form of a square, a space equal to the length of one brick being left at the front.

Air spaces ½in wide should be left between the bricks, as indicated. Before placing the next layer of bricks in position, a piece of stout iron plate is laid over the opening, as in Fig. 5.

Each layer above the second one consists of 10 bricks, and these should be carefully laid so that the bondings, or vertical joints, come as shown in Fig. 3. Vertical air spaces, at least ½in wide, should be left between all the bricks to ensure efficient ventilation.

To make a more permanent job the bricks can be cemented in position, and a good cement mortar for the purpose can be made by mixing 2 parts of Portland cement, 2 parts of sand, 1 part of lime and 1 part of red clay.

Add sufficient water to make a stiff mixture, and only apply the mortar to the horizontal courses between the bricks, leaving the vertical bondings open, as mentioned above, with the exception of the top layer, in which all the joints can be cemented.

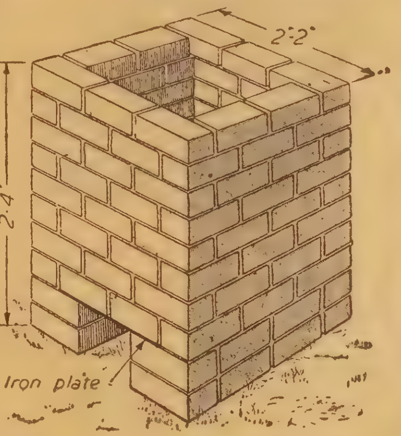


Fig. 3. — A brick incinerator of square shape.

When burning heavy rubbish it is sometimes necessary for proper combustion to maintain an air space below the rubbish, and one way of arranging for this is to place a couple of iron hearth trivets, of the pattern shown in Fig. 5, inside the incinerator for the rubbish to rest on.

For ordinary light refuse this provision will not be necessary.

An important point to bear in mind when erecting a brick incinerator of either pattern illustrated is the necessity of providing for the air spaces at regular intervals between the bricks, as it is on this liberal ventilation that the efficiency of the incineraor depends.

Finally, as a brick incinerator is not portable, and is rather an unsightly object from a garden-lover's point of view, it is a good plan to place it behind a screen or privet, or other shrubs.

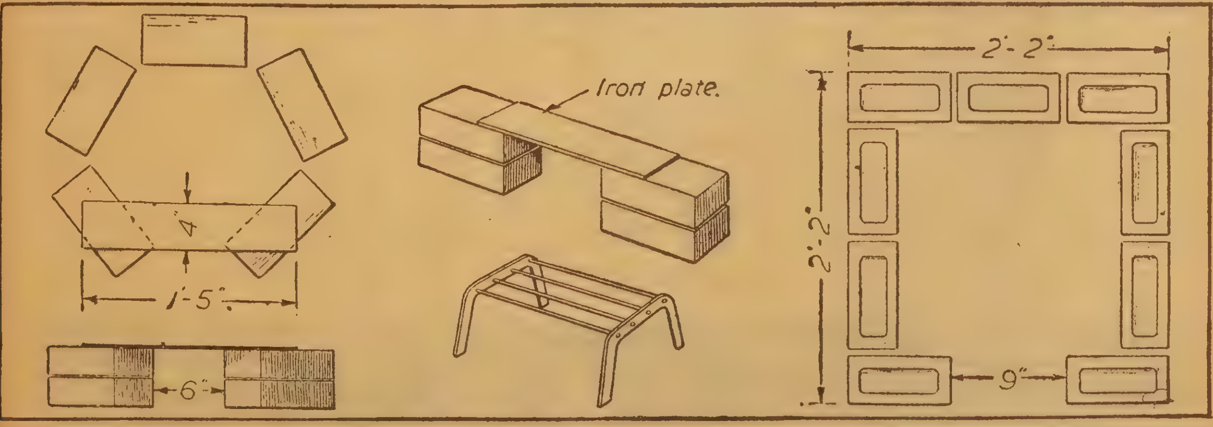
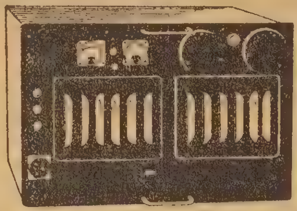


Fig. 2, left. Showing how the bottom two layers of bricks are arranged. Fig. 5, centre. Iron supporting plate and improvised fire bars. Fig. 4, right. How to arrange the bottom layer of the square-shaped incinerator.

MOTOR SPARES LTD

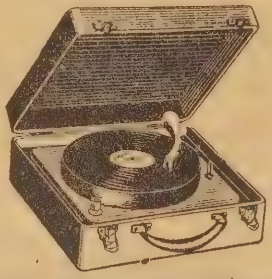


AT 300 TRANSMITTER

Radar Transmitter uses the following parts:—3—AV11 valves, 2—cyclatron valves, 2—4 ceramic socket, 1—24 volt motor, 2—01-5000 volt working condenser, 1—02-10,000 volt working condenser, 1—001-5000 volt mica condenser, 3—heavy duty transformers, 1—0-100 volt AC meter which is 0-1 MA movement with 1 MA dry metal rectifier fitted, 1—0-5 MA, DC, meter, and many other parts, such as stand off insulators, coils, etc. Worth £30.

Our price £4/19/6.

Weight 80lb.



RECORD PLAYERS

This record player uses a well-known brand of English electric motor and a good English Magnetic pick-up. The unit has a 2-pin socket for AC connection and shielded lead pick-up. It is extremely light in weight and is beautifully finished in Brown, or Black leather cloth.

Price £8/10/-.

Weight 13lb.

3-Speed English Gramophone Motors with heavy turntable adjusting knob changes motor speed to 33, 45, or 78 RPM. Ideal for both standard and microgroove records. Usual price £8/10/-. **Our price £5/10/-.**

Turn Over Head Type Crystal Pick-up to suit 3-speed motor with sapphire needles. **£5/5/-.**

Moving Coil Pick-ups. Light weight and excellent quality. Each pick-up with matching transformer. Worth £6/10/-.

Our price 19/6.

Light weight crystal pick-up, well-known make with standard cartridge and sapphire needle. Worth £5/15/-.

Our price £3/10/-.

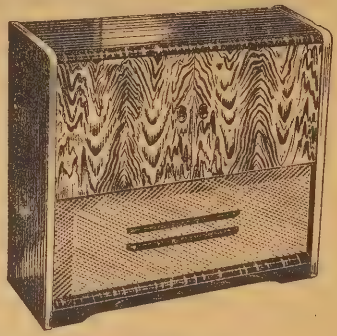
Microgroove cartridge and needle to suit. **£2.**

Few only Genuine H.M.V. Pick-up with matching transformer takes miniature H.M.V. Needle.

Price £2/15/-.

NOTICE

All parcels sent registered post unless otherwise stated. Postage or freight must be included with order.

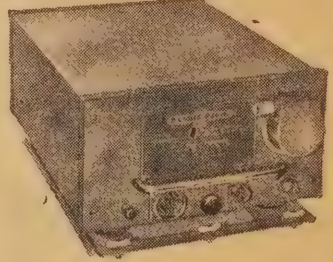


RADIOGRAM CABINETS

We have an extensive range of Radiogram Cabinets available in Walnut, Mahogany or Blonde Woods in nicely matched veneers. You can easily convert your old console or mantle radio to the latest in radiograms by fitting it to one of these cabinets with a Microgroove Record Changer or Player.

Price from £15/10/-

Models available both front opening and lift up lid types. Prices and Photos on application.



MN 26C RADIO COMPASS RECEIVERS

Brand new. Frequency 150 to 1500 KC with built in genemotor to work off 28 volts DC supply. Can easily be converted to 12 valve 240 volt AC broadcast communication receiver.

Price with valves 19 gns.
Less valves £12/10/-.

Weight 40lb.

SPECIALS

1. **Midget 2 Gang Condensers** suitable for BC. Brand new and boxed. Worth 18/6. **Our Price 9/6 ea.**
2. **Phone Jacks.** Two Jacks mounted on one piece of bakelite, 1 single circuit, 1 double circuit. Worth 10/6. **Our price 3/- ea.**
3. **Heavy Duty Rotary Switches.** Single Bank 4 pole, 3 posit on. Worth 12/6. **Our price 4/- ea.**
4. **Small Bakelite Escutcheons** suit CD17, MK17. Dials size of cut out 3 1-8 inches. Worth 3/6. **Our price 1/3 ea.**

SPECIALS

5. **Coaxial Cable** connectors female end only. **3d ea. or 2/- doz.**

6. **Heavy Duty** 11 pin plugs and sockets, pins are banana plug size **4/6 ea.**

7. Twin Bradley potentiometer 1-100,000 ohm pot. and 1-100 000 ohm rheostat operated from same shaft with metal knurled knob. **3/9 ea.**

8. Celluloids for Cadet 5 valve Mantles and Portables. Unobtainable elsewhere. **2/6 ea.**

9. Dry Metal Rectifiers, meter type suit 0-1, or 0-5 ma meter. Brand new. Worth 37/6. **Our price 25/-.**

10. VCR 97 Cathode Ray Tubes. Ideal for cathode ray oscilloscopes, television, etc. This 6in tube is cheaply priced at **38/6.**

11. 884 Gas Triode Valves. Brand new **28/6.**

12. 100ft outdoor Aerial wire insulated. Brand new **5/-,** 50ft lengths **3/6.**

13. Genemotors 5DY 83 ABI, 28 volts input. 575 volt output at 160ma suitable for amplifiers, etc., **£2 ea.**

14. **Genemotors. PE 94A.** Input 28 volts, output 300VDC at 260 ma, 150 VDC at 10 ma, 14 volts DC at 5 amps. Enclosed in a metal box with cooling fan, could be converted to 32 volt motor. **Only 25/- ea.**

15. **0-50 ma Meters.** Brand new English meters, boxed and perfect. Square dial with 2in scale. Ideal for multimeters, etc. Worth £3/10/-. **Our price 18/6.**

16. 0-40 volt meters similar to above. **Price 19/6.**

17. 0-20 volt meters similar to above. **Price 19/6 ea.**

18. 0-1 ma meters 1,000 ohms per volt square face, 2in scale. An excellent meter for building multimeters. **Price 32/6.**

19. Twin .02-600 volt Wkg. condensers in metal can, with pigtail connections. **1/- ea.**

20. AT5-AR8 Remote Control Units consist of double bank 3 position Oak wafer switch and terminal strip of 20 screw terminals, all in metal box 3 x 6 x 1½ inches. Worth 15/- **Our price 3/6 ea.**

21. RF Chokes wound on 7/8in diam. bakelite former. **1/- ea, 9/- doz.**

22. Black Instrument knobs to fit ¼in shaft, drilled and tapped for 2—5/32 grub screws. Diam. of knob 1 5/8in. A bargain at 9d ea. **6/- doz.**

547 ELIZABETH ST., MELBOURNE ALSO AT — ALBURY ARARAT BAIRNSDALE BALLARAT BENALLA BENDIGO BROKEN HILL COLAC DANDENONG ECHUCA SALE FRANKSTON GEELONG MILDURA SHEPPARTON ST. ARNAUD WAGGA WANGARATTA WARRAGUL

AC POWER FOR ELECTROFLASH

(Continued from Page 49)

of the metal in the vice several times during the process.

Next, two mounting holes are drilled in the short section and corresponding holes drilled in the side of the gun. It is as well to remove the "works" of the gun before doing this, to avoid damage. This will also facilitate fitting the nuts on the inside of the gun. Use screws which are no longer than necessary, and make sure that they are not likely to short any of the wiring. In our case, there was plenty of room and no need for modifications.

BRACKET MOUNTING

Make quite sure that the bracket is so mounted that the reflector is facing straight forward when attached to the camera. An error of only a few degrees can cause uneven lighting, particularly if the direction of the lens and reflector are diverging.

The longer section of the bracket supports the camera and a hole should be drilled near the opposite end through which a screw may be fitted into the camera tripod socket. Most tripod sockets are ¼in Whitworth and an ordinary brass screw may be cut down to suit, at least as a temporary measure.

The only snag with such a scheme is that the vital screw is very easily lost when the equipment is not being used, meaning that it is rendered virtually useless until the screw is found. There are plenty of occasions when this can mean a valuable picture lost for ever. To guard against such a contingency, it is better to fit a non-removable type screw and one of these is easily made if it is not readily available from a camera supply shop.

Such a screw has a portion of the shaft near the head devoid of thread, the length of such portion being equal, in this case, to the thickness of the bracket material. To make such a screw truly non removable the hole in the bracket is tapped to suit the thread and the screw is threaded into the hole until the clear portion of the shaft is reached. The screw will now be free to revolve so that it may be screwed into the camera, but cannot be removed from the bracket unless it is deliberately unscrewed from it.

MAKING THE SCREW

We constructed such a screw, using a ¼in Whitworth brass screw and a brass wing nut, tapped to suit. These parts may be obtained from most large hardware stores. The screw is threaded through the wing nut from the wing side and solder flowed under the head of the screw effectively to sweat the two parts together.

Next, a portion of thread is filed from the screw where it emerges from the other side of the wing nut, making the section at least as long as the thickness of the bracket. The remainder of the thread should then be trimmed to suit the death of the tripod socket.

It is also a good idea to drill and tap a hole in the bracket to permit the whole assembly to be mounted on a tripod if so desired. The exact position will be determined by the weight distribution of the gun and the camera and this can be found with a little experiment.

Another suggestion is to drill and tap a hole at the extreme end of the bracket, remote from the gun, and make a simple wooden handle, which can be screwed into it. The convenience of such an arrangement has to be experienced to be appreciated and some idea of how it is usd can be obtained from the photograph.

THE HANDLE

The handle we used was a 4in file handle, purchased for a few pence from a hardware store. Into the hole already drilled we managed to screw a ¼in Whitworth brass screw for a distance of about one inch. Then we cut off the head and screwed on a brass nut to serve as a lock nut. Finally we cut and trimmed the remaining length of thread to suit the thickness of the bracket.

Another arrangement, which makes for very quick and easy working, is an auxiliary bracket on the side of the gun to hold the cable release. This is so placed that the thumb of the hand holding the gun (left hand in this case) can operate it with a minimum of effort. (See photograph.)

The bracket can be made from a small scrap of aluminium and should be drilled to suit the metal ferrule on the end of the cable release (3-16in in our case). To enable the cable to be fitted without the necessity of unscrewing it from the camera, the hole should be slotted just wide enough to admit the thinnest portion of the cable.

This small bracket may be held by one of the main bracket mounting screws or, if this position is not convenient, a hole may be drilled and tapped in the body of the gun. Personal choice is the governing factor here.

FILM TESTS

As we intimated last month, we had hoped to test some other film types in time for this issue, particularly HP3 and FP3. Unfortunately we have been able to check only the HP3, but these results are rather interesting.

The tests were made under the same conditions as those described last month for Super XX and were of the same subject and developed in the same developers. (In the case of the Microdol it was the identical mixture.)

From these tests it would appear that HP3 may be given a guide number of 120 when developed normally in Microdol. When developed in D76 (normal time), the increase in speed is very slight, not more than half a stop, and would hardly appear to be justified in view of the coarser grain. Before next month's article we hope to prepare some more data.

One possible objection to the use of guide numbers, in practice, is the fact that one has to indulge in a bout of mental arithmetic every time a new distance is involved. While a simple enough problem in the ordinary way, it can prove quite difficult when one is trying to remember half a dozen other things as well and anything which will simplify its use is to be recommended.

The writer solved the problem by making a simple scale which is fitted around the focusing knob and calibrated to suit a certain guide number. In use it is only necessary to focus the subject on the ground glass (which must be done anyway) and then refer to the focusing knob where the correct stop value will be found opposite the infinity mark.

It would appear that there is an idea here for some enterprising camera manufacturer who should be able to produce a camera in which the diaphragm could be mechanically coupled to the focusing knob in the correct ratio for a selected guide number. In this way the diaphragm would be set automatically to suit whatever distance was selected and would make for extremely quick and simple working, particularly when using a coupled rangefinder.

HELICOPTER LIFTS HOUSE

IN USA, a helicopter has lifted a "flying house" big enough for 30 to 40 men and carried it through a stiff breeze to demonstrate how armies of the future may take their barracks into the battle.

On the basis test, the military may adopt the newly designed portable hut made of durable polyester-type synthetic fibre. The demonstration proved it may be carried easily and quickly by helicopter as the tides of battle shift.

The plastic-like dome, made of easily camouflaged translucent material almost as durable as steel, may be fitted over a wooden framework which can be erected rapidly by a few men. The framework also may be attached to the dome and the entire building, including even a floor if desired, would weigh little more than 1250 pounds. The helicopter circled in a 500-yard arc around a wide open field at a 35-knot clip and deposited the dome gently.

CONCRETE building blocks must stand 900lb per square inch pressure; recent tests of a fly-ash block showed it could take 1285lb.

AWA RONETTE
MICROPHONES & ACCESSORIES
TO-284
PICK-UP
CARTRIDGE
£2-12-0
In models N, P, OV, T and TS with individual replaceable sapphire stylus assemblies.
May be fitted to any tone arm having standard half-inch mounting centres.
CHANDLERS PTY. LTD.
ALBERT & CHARLOTTE STS.,
BRISBANE.
and leading wholesalers.

A.C.E. RADIO

Amplification Communication Electronics

PHONE: LA 3845

136 VICTORIA R'D. MARRICKVILLE, SYDNEY, N·S·W

EVENINGS and WEEKENDS: "KALUA", COLLAROY ST., COLLAROY — XW5956

DULWICH HILL, UNDERCLIFFE, EARLWOOD TRAM AT DOOR. STOP No. 42

AR8 Communications Receiver

6-band 140 to 20 megs 11 valve. Standard octal series.

Complete with valves and circuit.

£23/17/6

Completely converted for 240v A.C. operation including power supply, speaker & speaker cabinet.

£34/17/6

COMPASS SPIRIT FILLED 4in NAVIGATION UNITS

New Precision Units **17/6**

Postage N.S.W. 3/-, Interstate 5/-

New Coils & Intermediates standard or miniature to suit all valves.

Coils B/C 455 KC	7/6
Coils S/W 455 KC	7/6
Inters	9/6
Loop aerial coils	7/6
BFO units & 1500 KC IFs	12/6

CONDENSERS

ASSORTED MICA & PAPER WELL-KNOWN BRANDS

75 PF to .25 UF

15/- PER 100

SCR 522 Transceiver New condition 17 valve 100 to 150 megs including Photostat of circuit **£24/10/0**

NEW TELEPHONE WIRE

American 7 Strand Rubber Insulated

½ MILE DRUMS **£1/15/-**

CASE OF 6 DRUMS, 3 MILE, £10/-/-

TRANSMITTING CRYSTALS

.01% 2-8 mcs	£3/15/-
100 Kcs (RCA)	£5/5/-
1000 Kcs	£1/7/6

I.R.C. WIRE WOUND RESISTORS

20 WATTS 25, 36, 50, 1000 OHMS

40 WATTS 850, 6000 OHMS 2/6 EACH

IRC 1% WIREWOUND RESISTORS 20K, 30K, 50K, .1m, .15m, .2m, .25m, .5m, 1.0m. .. .. .. **7/6 each**

GENEMOTOR OF MANY USES

Converts to 1/6th H.P. A.C. motor drives as 6v 20amp or 12v 13 amp generator converts to A.C. rotary convertor **£2/17/6**

MOTOR START CAPACITORS

60UF, 240V, 50cs

20 starts per hour, 3 secs duration

£1/5/0

TELEPHONE LINE TEST UNITS

5 M.A. meter shunted to 50 M.A.

In carrying case **£1/0/0**

OILFILLED CONDENSERS

8UF 500V	10/-	1UF 600V	6/6
4UF 500V	7/6	.25UF 3000V	6/6
8 & 5UF 500V	10/-	2UF 2000V	12/6
4UF 400V	6/6	4UF 1000V	12/6

Assorted 200V rating up to 4UF, **10/- doz.**

Micro Switches (American)	2/6
Co-ax. Twin Cable, 20ft Lengths	8/-
Throat Mikes New	3/6
Mike Transformers	4/6
12v 420 Watt Prefocus Globes	7/6
Changeover Relay, D.P.D.T. Shielded	18/6
101 or F.S.6 7-pin Plugs & Cables	7/6
200 Ohm Relays	5/6
Butterfly Condensers 60x60	7/6
12y 50amp Contacters	10/-
AWA 6V Gasfilled Vibrators	15/-
Octal Sockets	Doz. 5/-
Hydrometers. Battery testers	5/9
Torches, 3-cell Focusing	9/9
Torches, 2-cell Focusing	6/9
Multi-Strand 5 and 7 Core Cable, yd	1/- 100 yd £2/17/6
2000V TX Var. Condensers 300uuf	£1/5/-
813 Sockets	12/6

RESISTORS

New; famous maker

100 ASSORTED—over 30 values

50 1 watt, 25 ½ watt, 25 ¼ watt

12/6

Command Transmitters

Transmitters & receivers complete with valves

£6/17/6 ea.

Hi Power Genemotors

6V—500V, 160MA

12V—550V. 350MA

£6/10/-

NEW VALVES

5Y3	10/-	812	£3
EZ82-6V4	10/-	12H6	7/6
7193	7/6	9004	10/-
6H6	7/6	6SK7	12/6
6SH7	7/6	6SQ7	12/6
813	£3	6SA7	12/6
807	£1	954	10/-
12SH7	7/6	1625	£1
12A6	12/6	843	£1/10/-
12SL7	12/6	6J6	15/-
12SJ7	12/6	6AK5	15/-
12SK7	12/6	6AG7	15/-
9001	10/-	866	20/-
6SN7	12/6	VR150/30	15/-
6C4	12/6	VR75/30	15/-
6AG5	12/6	VR105/30	15/-
6K7	9/6	2050	20/-
1K5	3/6	809	£2
VR65A	3/6	832	£2/10/-
957	10/-	717A	12/6
1P5	12/6	6SL7	12/6
6L6	£1	6N7	10/-

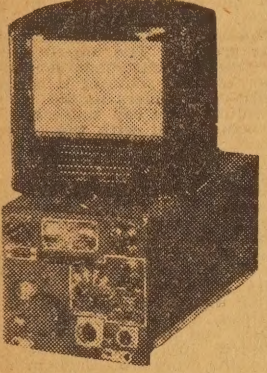
A
Amplification
C
Communication
E
Electronics

RADIO

PHONE
LA 3845

136 VICTORIA R'D. MARRICKVILLE, SYDNEY, N·S·W

EVENINGS and WEEKENDS: "KALUA", COLLAROY ST., COLLAROY — XW5956
DULWICH HILL, UNDERCLIFFE, EARLWOOD TRAM AT DOOR. STOP No. 42



Converted, Air-tested.
Complete with Power
Supply and Speaker.

240V AC	£29/17/6
24V DC	£27/17/6
12V DC	£32/17/6
32V DC	£28/17/6
6V DC	£37/10/-

Brand new
£22/10/-

A.R.B. RECEIVERS

MADE BY R.C.A., makers of world-famous AR88

IDEAL FOR small ships, bushfire fighting units, Q5ers, &c.

FEATURES:—Coverage 195Kcs to 9.025 Mcs continuous.
Switched I.F.s 130Kcs and 915 Kcs.
6 single-ended 12 volt tubes.
Broad/sharp I.F. selectivity control with flat-topped I.F. response.
Mechanical and Electrical Bandswitching.
Directly calibrated, illuminated, 40:1 ratio dial with anti-backlash spring loading.
Neon stabilized local oscillator.
Output impedance 4000 ohms and Lo-phones.
Glass-fibre hook-up wire throughout.
Circuit supplied.

£19/10/-

NEW
COLLARO
PICK-UP
Plug-in mag. head, turntable, auto-stop.
12/6
Packed weight 6lb.

NEW
PLESSEY
Record players for 10in & 12in records. Hi fid. Decca mag. head.
£4/17/6

NEW LATEST MODEL
COLLARO
521
3-SPEED CHANGERS
78, 45, 33
WITH TWIN CRYSTAL HEADS
£15/15/0

BENDIX
BC221. FREQUENCY METERS. AIR TESTED
Original Crystal and Calibration Book
£45/0/0

NEW B.S.R. TYPE G.U.4. 3-SPEED PLAYER UNITS. TURN-OVER CRYSTAL P.U. FOR 33, 45, 78, RECORDS
£9/17/6

A.R.7. COMMUNICATION RECEIVERS

Made under licence of American National H.R.O., the A.R.7 is the finest achievement in communications field used by Australian Services. It is standard equipment with all leading airlines. 9-valve 240 A.C. operation features signal strength meter, crystal gate, 2 R.F. stages, 2 I.F. stages, noise limiter, 5 band, 140 K.C. to 25 MEGS.

AIR TESTED **£47/10/-**

NEW A.R.R.2 RECEIVERS
A V.H.F. receiver, 230 to 258 Megs, and 6 channels on broadcast band. Ideal conversion to carset and for hams. A ready-made, double-conversion V.H.F. receiver. 10 miniature valves, smaller than average carset.
Including photostat of circuit.
PRICE **£11/17/6**

NEW
AMERICAN INDICATOR UNITS
11 valves, 3 B.P.I., C.R.O. Ideal for oscilloscope or panel adaptor. In original cases with all plugs, cables etc.
PRICE **£11/17/6**

ANSWERS TO CORRESPONDENTS

L.C. (Williamstown, Vic.) raises a point regarding the output figures of pickups and their relation to the dynamic range of the records.

A. The figure quoted is merely intended to serve as guide when designing an amplifier and to indicate the approximate order of gain required. It is normally quoted in RMS values. We feel that you are worrying unnecessarily about the dynamic range and the possibility of overload and that in practice you will not encounter trouble. We cannot say at what level, relative to the minimum and maximum possible, the cut is made on the record but it is usually fairly high in order to minimise scratch level for purposes of measurement. In any case, there would be little danger of overload when working with such low level inputs, since any normal amplifier stage will handle several volts without overload. In general terms, it would be fairly safe to say that an amplifier having sufficient sensitivity to be driven to full output from a 50mV input, would be suitable for use with this pickup, though it may not have much gain to spare for records cut at a low level. If it had several times this sensitivity it would be better and there would still be no danger of overload in a properly-designed outfit. We would also point out that the dynamic range of modern records is nothing like 100 db and half this figure would be much nearer the mark. We agree that the present chaotic condition of the recording characteristics is very undesirable, but there appears to be very little that can be done at present. The 7193 valve has similar static characteristics to the 6J5, though it is actually intended for use at frequencies up to 300 Mc. We cannot say whether it is suitable for low level audio stages though it should be suitable for later stages.

A.N. (Ryde, NSW) enquires whether there were any errors in the Superhet Four with AVC, having built this set without success. He also wants to know if we intend publishing a circuit to convert the Little General circuits to AVC.

A.: As far as we know there are no errors in this circuit and a large number have been successfully built from the published data. If you cannot locate the trouble in your set we suggest that you enlist the aid of serviceman or someone with a little more experience than yourself. There were at least two circuits of the Little General which employed AVC, the D/W Little General of December 1941 and Little General for 1946. Both these circuits are available from our files. The Superhet Four is virtually identical with the Little General circuit and is fitted wth AVC.

K.J. (Alphington, Vic.) submits a number of suggestions for possible articles at some future date.

A.: Thanks for your suggestions, K.J., which are always welcome. Your idea of learning the Morse Code with the aid of pictures is not fundamentally a good one because it introduces an extra mental process which eventually slows up the process of reading the code. The point is that the code is essentially a sound language and the whole point of one's training is to be able to write down the letter automatically in response to the sound character. Learning it by the method you suggest forces the brain to turn a sound into a picture and then into a letter. Some time ago we published an article on using the sun's rays for heating purposes. As a matter of fact we can recall a story on some French experiments and also a longer article which made reference to experiments in New South Wales. While most of the schemes are feasible, most people prefer to accomplish the same result more conveniently and more cheaply by the use of conventional fuels. The Services developed quite workable gadgets for converting sea water to drinking water, but we have not seen any information which would suggest that the process can be stepped up sufficiently to allow it to be used economically for watering the garden.

R.J.D. (Maroubra, NSW) makes some enquiries about the Tape Recording Amplifier No. 2.

A.: This amplifier was designed for use with medium impedance heads such as are generally available commercially. The oscillator voltage across the erase head should be adjusted to maximum by varying the value of the coupling capacitor. The highest reading will be obtained where the circuit becomes resonant at the bias frequency. The recording head should be connected as shown with a low value capacitor. Actual voltage figures are of little significance due to the high frequency errors in the meter brought about by capacitive shunting.

J.S.B. (Ashfield, NSW), is using crystal set with a small capacitor series with the aerial lead in order improve the selectivity. However, finds that if he happens to short t capacitor it causes static noises in t family AC operated receiver.

A. This is quite normal and need n cause any worry. An electric char builds up on the aerial due to wir friction, &c., when the capacitor is place. Shorting it allows the charge flow to the ground. The minute electr transient causes electromagnetic energ to be generated and some of it is picke up by sensitive receivers in the vicinit The only solution we can suggest is th you don't experiment with the capacito when others are listening to favori programs. Many thanks indeed fo your kind remarks.

W.S. (Bexley, NSW) writes to sugge that we present an article covering th various types of microphones, their principle of operation, characteristics, &c.

A. Many thanks for the suggestio W.S., and we will keep the idea in min Your letter has been passed on to th Answer Tom department for possible us in this series. In the meantime yo will probably find that one of the better quality crystal inserts would be quit suitable for the work you have in min

J.F. (Bathurst, NSW) suggests that th Handie Talkie described in R. and H for October, 1950, would be ideal fo bushfire work if it could be modifie for use on the 2 to 8 Mc band.

A. Unfortunately, J.F., this unit wa a very simple device designed to tak advantage of the lesser restrictions o the 144 Mc band, and is quite unsuitable for use on the frequencies you mention. Neither the type of transmission or the receiver would be permitted by the authorities.

D.M. (South Aust.) makes some inquiries about a tape recorder mentioned in one of our advertisements.

A. We regret we have no information available about this device and we can only suggest you write to the advertiser direct.

W.R.S. (Otautau, NZ) complains that he cannot obtain any information in NZ regarding the 6M5 valve specified in the recent intercomm. unit.

The 6M5 is really a miniature version of the EL3 and is one of a series manufactured in Australia. You should be able to obtain the characteristics from Philips Electrical Industries, Margaret and Clarence Streets, Sydney.

R.S. (Suva, Fiji) asks some questions about the oscillator section of a receiver, such as possible cause of failure and how to test it.

A. Possible causes of oscillation failure would be: The valve itself, reduced operating voltages due to failure of the rectifier, or losses in the tuned circuit (gang, coil, &c.), due to humid atmosphere. The most satisfactory test for oscillation is to insert a 0-1 mA in series with the oscillator grid resistor at the earth end. The current reading will vary with the frequency but should be between .2 and .6 mA. Absence of grid current means oscillation has ceased. Sometimes oscillation will only occur at certain dial settings. In your case it would seem most likely that the HT voltage has dropped, due to a faulty rectifier and that this has caused poor performance on the broadcast band and caused the short-wave bands to fail completely. Alternatively, there could be a fault in the wave change switch which only occurs in the short-wave positions.

R.L.T. (Arncliffe, NSW) sends a contribution for the Serviceman Who Tells and which concerns some equipment which he recently built.

A.: Many thanks for your contribution R.L.T. and your letter has been passed on to the serviceman. From your description it seems unlikely that the trouble is due to supersonics, while it is equally difficult to blame the output transformer. The most likely cause would appear to be grid current, due either to the valve being enclosed and becoming too hot or running it at excessive plate or screen voltage.

THE "RADIO & HOBBIES" QUERY SERVICE

ALL queries concerning "R & H," designs, to which a POSTAL REPLY is required must be accompanied by a postal note or stamps to the value of TWO SHILLINGS.

For the same fee, we will give advice by mail on radio matters, provided the information can be drawn from general knowledge. UNDER NO CIRCUMSTANCES, however, can we undertake to answer problems involving special research, modification to commercial equipment or the preparation of special circuits.

Whatever the subject matter, we must work on the principle that a letter is too involved if the reply takes more than 10 minutes of our time.

Queries not accompanied by the necessary fee will be answered FREE in the columns of the magazine and presented in such a way as to be of interest to others readers.

To those requiring only circuit reprints, &c., we will supply for TWO SHILLINGS diagrams and parts lists from our files covering up to three "R & H" constructional projects. Scale blueprints showing the position of all holes and cutouts in standard chassis will now be 4/6. These are available for nearly all our designs but please note they do NOT show wiring details.

Address your letters to The Technical Editor, "RADIO and HOBBIES," Box 2728C, GPO, Sydney.

Note that "RADIO & HOBBIES" does not deal in radio components. Price quotations and details of merchandise must be obtained direct from our advertisers.

r. (Collingwood, Vic.) asks for our nents on connecting two speakers in llel to his radio instead of the usual le speaker.

: There is nothing to be gained in way of improved frequency response our case since both the speakers have lar response characteristics. Your le 6V6 will not deliver sufficient power verload either of the speakers alone hat there is no point in including the a speaker from the point of view of er handling capacity. However, the ngement would have the advantage the source of sound is spread over rea rather than concentrated. This is ntirely artificial effect but there are ity of people who like it. Care should aken that the speaker connections are phased that the outputs from the kers tend to add rather than subtract. ou were to connect your two speak- in parallel, one fitted with a 2000 ohm sformer and the other with a 4000 transformer, the load presented to valve would be only 1720 ohms. It ld be better to use only the 4000 ohm sformer and connect the two voice s in parallel. If the idea appeals to you r a reasonable trial it may be worth- le purchasing a special transformer the job. It is not important if the e coils of the speakers are not earthed it does not matter which of the trans- ner primary leads is connected to the tension.

.W. McD. (Auckland, NZ) is interested the Playmaster series and is using a ymaster No. 1. Control Head No. 2, a crystal turnover type pick-up. He plains of overload troubles and sug- ts that we publish some data on the nection of various types of pick-ups.

.: Mention was made in the original cles on the Playmaster series that y were intended for use with low out- magnetic type pick-ups which required s compensation to suit the recording racteristics. The use of crystal pick- with equipment of this type can only regarded, at best, as a compromise angement. We have published several cles on crystal pick-ups and their racteristics, one of which was in the vember 1952 issue. Briefly the char- eristics of crystal pick-ups are a high put and a rising bass characteristic ich compensates fairly well for the al recording characteristic. For this son the additional gain and frequency pensating features of the Control d are largely wasted, plus the fact t overload is almost certain. By oper- g the pick-up into a reduced load out .05 meg) and tapping this load to uce the output, it can be made to ave something like a magnetic type may then be fed into a Control Head.

.J. (Alphington, Vic.) wants to know there is any type of tuning meter ilable for use with crystal sets to ote correct tuning.

.: No. K.J., such an arrangement would be feasible since the amount of wer required to operate the device uld be many times that of the power mally available in a crystal set. In any e the tuning of such sets is usually so ad that such a device would not be essary.

.V.R. (Abbotsford, NSW) writes again give further details of what he would e to see in a new signal tracer. He has mind something more elaborate than instrument recently described in dio and Hobbies.

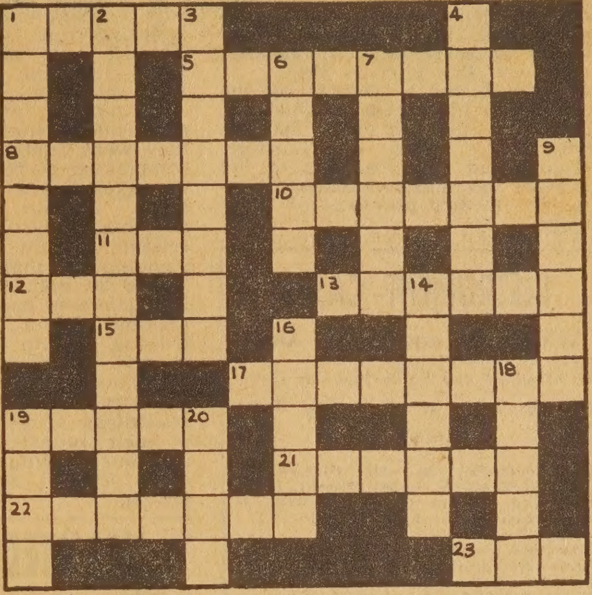
.: Thanks indeed for your further ter, J.V.R. As we said before the nior Signal Tracer does a sterling job d only a small percentage of readers ll require anything more elaborate. wever, we do recognise that such ders exist and will do our best to isfy the need at the first opportunity. a matter of fact we have one or two vel ideas in mind which will help to ke a future instrument a success. ur suggestions have been noted.

.M.N. (Launceston, Tas.) enquiries out the tuning capacitor for the "Tom umb", being unable to obtain the ginal type.

.: The tuning capacitor and reaction pacitor used in the Tomb Thumb were th of the same type, being a solid electric variety. These are no longer ailable but a substitute is a standard niature gang of approximately 400 pf the tuning circuit and a 100 pf for the action control. However, it is unlikely at these will be able to be accommod- ed on the original chassis.

Many thanks for your comments on the ar-Set and we are pleased to learn that is functioning so well.

THE R & H CROSSWORD No. 3



ACROSS

1. Used for HT filtering.
5. Negative resistance valve.
8. Has three grids.
10. Insulating material.
11. A clinging vine.
12. North (abbreviated).
13. Measures resistance.
15. Signal to go ahead.
17. A type of field.
19. Low compliance.
21. Type of detector.
22. Opposes.
23. Distress call.

DOWN

1. Connection between circuits.
2. No electrical connections (two words).
3. Autodyne frequency changer.
4. Making firm connection.
6. A primary color (TV).
7. Three element valve.
9. A system of units.
14. Absorbs air from valve.
16. Small advertisements.
18. State in North America.
19. Classify.
20. Overload protection.

Solution and further crossword next month

L.E.R. (Canberra, ACT) sends us a contribution for the Serviceman Who Tells page, detailing a recent problem which caused him considerable bother. He also comments on how much he enjoys the above series as well as the "Lets Buy An Argument" articles.

A.: Many thanks for your contribution L.E.R., and we have passed your letter on to the serviceman for his possible use at a later date. Thanks also for your kind remarks and we are glad to learn that you find these articles so interesting.

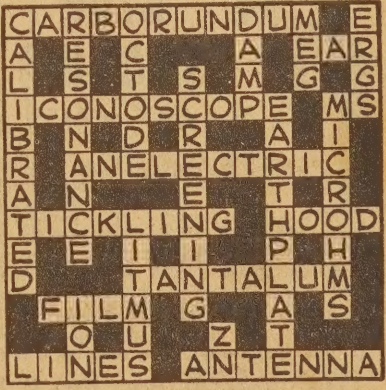
A.B. (Mackay, Q) sends some questions for the Answer Tom page and also makes some comments about brands on components and the problems of crystal pick-ups in the tropics.

A.: Many thanks for your letter and kind remarks, A.B., and we have passed your questions on to the staff member who answer Tom's problems. On a quick check we would say that your assumption regarding the voltages across the various capacitors would be correct. We agree that the methods of branding many components leaves much to be desired and it is to be hoped that manufacturers will improve this aspect of their products in the future. Your remarks regarding the effects of humidity on crystal pickups is very interesting though we find it hard to explain the failure of the ceramic type. Under conditions of such high humidity it might be worth considering storing such devices in containers of silica gel, though it must be pointed out that too dry an atmosphere can also cause trouble to these devices. Another important point is that high temperatures cause the normal crystals to dissolve and this is frequently a cause of trouble as actual humidity.

N.F.D. (Northcote, Vic.) enquires about the value of feedback resistor required in the No. 6 Playmaster Amplifier for 2 and 8 ohm voice coils. He also enquires about calculations of the feedback factor and queries a statement in a recent article on testing amplifiers.

A.: The voltage across the voice coil will change as the square root of the impedance change and the feedback resistor should be reduced by this factor. In your case the approximate values required will be 550 ohms for a 2 ohm circuit and 1100 ohms for an 8 ohm circuit. The calculation of the actual amount of feedback provided by a given circuit is rather complex and, while it can be calculated, it is usually easier to determine it experimentally. The figure of 7 volts as quoted in the article is admittedly rather low on second glance. However, it must be realised that, due to transformer losses, 9 watts in the primary (representing the overload point of a typical push-pull system) might produce only about 6 watts in the secondary. Since we wished to emphasise the need to keep clear of overload we said that this would be "approaching" the limit. Providing the individual was prepared to undertake his own calculations he could run a little farther up the scale than this. The formula you quote is correct.

Last Month's Solution



EYES CAN TAKE IT IF HOMEWORK LONGER

MANY boys and girls will be spending longer hours on their homework, if teachers follow the findings reported by Dr. Leonard Carmichael at a seminar at Jackson Laboratory, Bar Harbor, Me.

Dr. Carmichael is secretary of the Smithsonian Institution in Washington, DC, a member of the Jackson Laboratory's Board of Trustees, vice-president and chairman of the executive committee of Science Service, and former president of Tufts College.

The studies he reported show that most persons can read uninterruptedly for six hours without actually suffering from eye strain or fatigue. This is true for persons reading from both the printed page and from microfilm.

A number of the high school and college students thought what they were reading was dull. These complained of feeling tired, of feeling eyestrain and of "wishing to stop". But the tests did not show any loss of measurable efficiency of reading or any change of understanding the material.

The 20 high school and 20 college students each spent six hours reading Adam Smith's economic treatise, Wealth of Nations, volume 2, and six hours reading Richard Blackmore's novel, Lorna Doone. Electrical devices gave continuous recordings of every eye movement of each student during each of the six-hour reading periods. The records totalled some 15 miles in length.

INSTRUMENT CASES

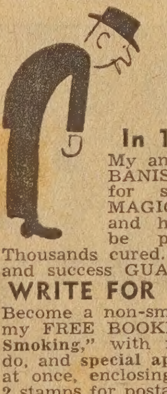
Wholesale and Trade Only

All Standard and Radio Hobbies Cabinets obtainable at all leading Radio Distributors.

We specialise in All Classes of Covered Cabinets — Instrument, Portable and Mantel Radio Cabinets in either Leather or Leatherette.

Interstate Representatives: J. H. Williams & Co., 50 William St., Melbourne; B. L. Andrews, 144 Gawler Place, Adelaide, SA; H. M. King & Sons, King George Square, Brisbane, Qld.; Affiliated Agencies, 92A Barrack St., Perth, WA; L. V. McPartlan, 223 Liverpool St., Hobart, Tas.

GIBBONS & DENHAM
15 FARIOLA ST.,
NORTH LIDCOMBE. YX1456



SMOKING got you down?
Now there is an easy way for you to conquer smoking before smoking habit has a chance to conquer you.

STOP SMOKING

In 1 DAY or LESS

My anti-smoking discovery BANISHES your craving for smoking. Acts like MAGIC. Improve appetite and health. Save money; be pounds in pocket. Thousands cured. Inexpensive speedy, and success GUARANTEED.

WRITE FOR FREE BOOKLET

Become a non-smoker by sending for my FREE BOOKLET, **"How To Stop Smoking,"** with instructions what to do, and **special application form.** Send at once, enclosing name, address and 2 stamps for postage.

JACK ELWOOD, Dept. RH5/4,
Box 2444, G.P.O., SYDNEY.

Precision Turned Aluminium Turntables and Shaft Complete.

Drop in replacement for MU14 and GU4 B.S.R. motors. Eliminates wow and flutter.

£6/7/6, postage 8/6

Bearings can be supplied for above at 15/- each.

Agents for Crystal High Frequency Speakers.

A. F. KNOWLES
149 Union Rd., Surrey Hills,
E.10, Vic. Phone WX3602.

WANTED TO BUY, SELL OR EXCHANGE

FOR SALE: Williamson Amplifier and Radio Combination. 2 Swedish Maple Cabinets, 3-speed Motor, Acos pick-up 2 heads, Goodman Speaker, &c. Radio not wired, owner lacks time. The lot — £60. **UM9789.**

FOR SALE: 1 TA12 Bendix Transmitter converted 80, 40 and 20 metres, power supply, modulator. 1 108 Transceiver, 1 Class C wave meter. Sell whole or part best offer. Write **T. Williamson, Adele St., Yass.**

FOR SALE: Zenith AC Mod OSC No. 11 set. Amplifier and Port. Radio. Cheap. **FY4501.**

FOR SALE: Pure sine wave oscillator bias and erase units, in kit form, fully adjustable, including 2 valves and circuit, £8/17/6 post free. **Electronics Australia Pty. Ltd, 41 Enfield St., Victoria Park, Western Australia.**

SALE: No. 11 Transceiver. Complete. Never used. Best offer. **1 Wippa Court, Jordanville, Melbourne.**

SELL: AWA Mod Osc 3J6726 £18, AWA C W'meter, new £10, P26 HF Receiver £4. **Butler, 1 Darley Rd., Randwick.**

SELL: R & H Vacuum Tube Volt Meter in new condition. **H. Knight, Coramba St., Coffs Harbor,**

SELL: ML 20 Amplifier and tone-control unit, £40. Also Axiom 150 vented enclosure £20. **JM2524** evening.

SELL: 16-inch two-speed turntable £10. Thorens three-speed turntable £27. Walnut vented baffle £20. Cost £45. **JA8647.**

SELL: Complete kit of parts to build 50 watt amplifier, using two power supplies. Further particulars write: **F. Smith, 32 William St., Forbes.**

SELL: Vols. 1, 2, 3 & 4 of AORSM, 30/- or offer. **F. Walker, Dulacca, W. Line, Queensland.**

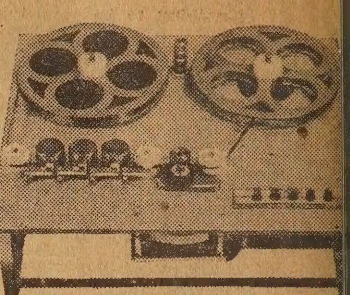
AUTHORS invited submit MSS all types (including poems) for book publication. **Stockwell Ltd., Elms Court, Ilfracombe, England, (Estd. 1898).**

WANTED: 5000 ohm relay as found in SCR-522-A communications set. **K. Ratcliffe, C36 Coal Stage, Mt. Isa, Nth. Q.**

WANTED: August 1946 R & H. **A. Gordon, 24 Philip St., Roma, Qld.** Pay 5/-.

WANTED: Australian Official Radio Service Manual, Volume Nine, 1950 circuits. Will pay £3 good condition. **W. Teerman, Addison St., Shellharbour, NSW.**

"BRADMATIC"



PROFESSIONAL TAPE RECORDER DECKS

3 HEADS — 2 SPEEDS
3 MOTORS
TAKES 2250FT REELS

FULL DETAILS FROM
ELECTRONICS Aust. Pty
41 Enfield St. Victoria Park, W.A.

All "Bradmatic" Heads, Decks, Oscillat
and Plate Coils in stock.

Distributors for Victoria, S.A., Queenslar
and W.A. only.

Always Rely On R.D.S.

R D S

(1) AWA Vibrator Packs, bran
new, at £2/7/- each.
(2) New Type Collaro Recor
Changers now available.
(3) Distributors for Semak Vit
misers.

We can supply all Radio and Ele
trical Components and are agen
for the famous Hotpoint Radio Set

Distributors of Test Equipment, Valve an
Circuit Testers, Multimeters, etc.

A Complete Mail Order Service for th
Countryman. Call, write or phone to:—

The Independent Wholesaler,

RADIO DESPATCH SERVIC
Radio and Electrical Distributors,
GROUND FLOOR, WEMBLEY HOUSE,
841 GEORGE ST., SYDNEY.
Phone MA1876. Open Saturday Morning

SONGSTER REGD
PICK-UP & PHONO
NEEDLES

HOBBY BOOKS

"All About Television". Illustrated. Popular Mechanics Press, 33/6. Radio, T.V. & Electronics H'book, 27/6. Planning Your Home Workshop, 27/6. "What To Make" series, 11/4 each, 6 different. 200 One Evening Projects, 7/8. Photo Handbook, 21/9. Money Making Hobbies, 21/9. Money From Ideas, 28/6. Outdoor Sports Manual, 21/-. Home Workshop Projects, 11/2. FREE LISTS OF MANY MORE. I have hundreds of books available, send for FREE lists NOW. SPORTS, MOTORING ENGINEERING, HOBBIES, MODEL RAILROADS, PHOTOGRAPHY, GARDENS, ATHLETICS, ETC.

JACK KERNOHAN,
P.O. Box, Moorabbin, Victoria.

Printed and published by Associate
Newspapers Ltd., at the registered offi
of the company, 60-70 Elizabeth Stree
Sydney, NSW.